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ography on Cosmic Rays in the Atmosphere (1953–1956), p. 488

7 April 1956 No. 4

METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 7 APRIL, 1956 No. 4

SPECIAL FEATURE IN THIS ISSUE

An Annotated Bibliography on Cosmic Rays in the Atmosphere (1953–1956)

by

Mary L. Rice and Geza Thuronyi

(*For complete table of contents see back cover*)

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FOREWORD

Meteorological Abstracts and Bibliography is a monthly publication whose purpose is to ›ring to the attention of meteorologists current literature in their field and in related fields and o provide bibliographic information on various subjects, as interest demands.

Part I contains abstracts of current literature in the fields of meteorology, oceanography, tc., arranged according to the Universal Decimal Classification.

Part II of each issue comprises a special annotated bibliography of important references n a special subject. No attempt is made to prepare exhaustive bibliographies; instead, the im is to include a representative cross section of the various aspects of a subject.

Bibliographies published in the successive issues were:

Vol. I, 1950

. Atmos. Pollution	2. Aerobiology	3. Cloud Physics	4. Hail
. Tornadoes	6. Volcanic Dust	7. Climat. Changes	8. Thunderstorms
). Icing	10. Acoust. Propagation	11. Evaporation	

Vol. II, 1951

. Extended Forecast.	2. Long Range Forecast.	3. Soil Temp.	4. Constants, etc.
. Clim. of Near East	6. Clim. of Middle East	7. Special Winds	8. Radar Storm Detect.
). Condensation Trails	10. Clim. of N.E. Africa	11. Mountain Met.	

Vol. III, 1952

. Clim. of N.W. Africa	2. Carbon Dioxide	3. Clim. of Argentina, etc.	4. Dew
. Objective Forecast.	6. Stratus Forecast.	7. Urban Climatology	8. Clim. of C. Africa
). Visibility	10. Glaze and Rime	11. Free Air Turbulence	

Vol. IV, 1953

. Turbulence Theory	2. Turbulent Diffusion	3. Frost	4. Clim. of Australia, etc.
. High Level Winds	6. Winds in Stratosphere	7. Jet Stream	8. Radiation Bioclim.
. Clim. of Pacific	10. Auroras	11. Sferics	

Vol. V, 1954

. Oceanog. Met.	2. Clim. of S.E. Asia	3. Auroral Physics	4. Tropopause
. Balloons	6. Numerical Forecast.	7. Radiation Data	8. Vertical Motion
. Clim. of Arctic	10. Industrial Met.	11. Wind Waves and Swell	

Vol. VI, 1955

1. Bibliog. of Bibliog.	2. Texts & Monogr. Bibliogs.	3. Storm Surges
4. Ionospheric Prop.	5. Photochem.—Upper Atmos.	6. Cloud Physics
7. Radar Cloud Physics	8. Atmos. Nuclei (1841–1950)	9. Atmos. Nuclei (1951–1955)
0. Weather Modification	11. Cooling Power	

Bibliographies published this year are:

1. **Synoptic Meteorology of the Arctic**, Vol. 7, No. 1, Jan. 1956
2. **Climate of Enclosed Spaces**, Vol. 7, No. 2, Feb. 1956
3. **Cosmic Rays in the Atmosphere** (–1952), Vol. 7, No. 3, March 1956
4. **Cosmic Rays in the Atmosphere** (1953–1956), Vol. 7, No. 4, April 1956

Forthcoming bibliographies will be:

5. Atmospheric Radioactivity, Vol. 7, No. 5, May 1956
6. Tropospheric Inversions, Vol. 7, No. 6, June 1956

Other bibliographies in preparation are:

Actinometers
Climate of the Arctic
Fog Forecasting
Microwave Propagation
Night Airglow
Ozone
Singularities
Snow Cover
Synoptic Aerology
Tropical Cyclones

Part III contains a listing of the contents of those journals which are primarily meteoro›gical. These are published in the earliest issue where space permits.

Part IV is made up of author, subject and geographical indexes. In the December issue umulative author, subject, geographical and journal indexes are published.

EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory Library, Milton, Mass.

Other symbols:

*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts

Geographic locations are in the English form rather than the form used locally, for example Moscow for Moskva.

Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau*, *Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

MAJOR GENERAL WORKS

COLLECTED WORKS

7.4–1 551.5:061.2

Deutsche Meteorologische Gesellschaft, Berlin, Sept. 28–Oct. 4, 1953, **Die Tagung der . . . Gesellschaft, Teil II, Beiträge zur Klimatologie und Allgemeinen Zirkulation, Optik und Strahlung, Agrar- und Mikrometeorologie.** [Meeting of the Society, vol. 2, Contributions to climatology and general circulation, optics and radiation, agro- and micrometeorology.] *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 2(4), **1955.** 204 p. figs., tables, bibliogs. **DWB**—A collection of 15 substantial papers on the several subjects mentioned in the title. In the appendix, long abstracts on 16 other papers (not yet submitted for publication) read at the Seminar in Berlin (1953) are given. Seven more papers, for which no abstracts were received, are listed. The above papers are on numerical forecasting, stratospheric warming, evaporation, radiation, etc. *Subject Headings:* **1. Meteorological seminars 2. German Meteorological Society meetings.** —*M.R.*

7.4–2 551.508(05)

Germany. Deutscher Wetterdienst. Instrumentenamt Nord, Hamburg, **Technische Mitteilungen des Instrumentenwesens des deutschen Wetterdienstes, Neue Folge, No. 1.** [Technical contribution from the Instrument Division of the German Weather Service, No. 1.] Hamburg, **1955.** Contents: **Inhaltsverzeichnis, No. 1–28, 1946–1954,** p. iii–ix. Olbers, W., **Grundlagen der objektiven Wolkenhöhenmessung** [Principles of objective measurement of cloud height], p. 3–18. Georgi, J., **Kleine Hilfsmittel für Strahlungs- und andere physikalische Messungen** [Minor aids to the measurement of radiation and other physical phenomena], p. 19–21. Georgi, J., **Unsymmetrische Erivärmung und Strahlungs- und Abkühlung bei Strahlungsschreibern** [Asymmetrical heating and cooling in sunshine recorders], p. 22–28. Pauly, E., **Die Genauigkeit der nach der Hergesell-Kleinschmidtschen Formel berechneten Temperaturkorrektion für Luftdruckmessungen der Radiosonde H 50** [Accuracy of the temperature correction for atmospheric pressure measurements of radiosonde H 50 calculated according to the Hergesell-Kleinschmidt formula], p. 29–43. Graafen, H. and Pauly, E., **Die temperaturbedingte Luftdrukkorrektion der Radiosonde H 50 auf Grund von Druckkälteeichungen** [Atmospheric pressure correction of radiosonde H 50 due to temperature on the basis of cold pressure calibration], p. 44–49. (Articles abstracted separately.) **DWB**—This new series is the successor to the series **Technische Mitteilungen der Instrumentenabteilungen** of which 28 issues were published between 1946 and 1954 under the old organization "Zentralämt für Nordwestdeutschland." An author and subject index to Nos. 1–28 are included in the first number of the new series (which is put out in a more permanent form of binding than that of the earlier). *Subject Headings:* **1. Meteorological instruments 2. Serial publications.**—*M.R.*

7.4–3 551.582(237.1) 551.583.2:551.311.12

Bender, V. R., Haines, A. L., Hofmann, W. and Troll, C., **Der Mount Rainier, Washington und seine Gletscher.** [Mt. Rainier, Washington and its glaciers.] *Erdkunde*, 9(4):263–286, **1955.** chart, 4 figs., 5 photos., tables. English summary p. 263–264. **DWB**—Includes: Troll, C., **Der Mount Rainier und das mittlere Cascaden-Gebirge.** [Mt. Rainier and the central Cascade Range], p. 264–274. Bender, V. R. and Haines, A. L., **Forty-two years of**

recession of the Nisqually glacier on Mount Rainier, p. 275–281. Hofmann, Walther, **Kartographie und Gletscherkunde am Nisqually-Gletscher.** [Cartography and glaciology on the Nisqually glacier], p. 281–286. TROLL describes the general characteristics of the region, origin of relief, horizontal and vertical climatic zoning, vegetation, and the wind and weather in the Columbia gorge and their effects on tree growth. Owing to the strong winds and especially the ice storms and parch blight, fir and spruce are deformed towards the west in the west and towards the east in the east. Bushes protected by snow are unaffected. BENDER and HAINES describe the recession of the Nisqually glacier from 1910–1952 (but which began about 1850). The climate is briefly surveyed with a monthly table for Longmire (842 m) and Paradise Park (1668 m). Survey methods are described. In 1910–1952 length has decreased from 7.10 to 6.37 km, and area from 6.994 to 6.22 km². The average annual loss was 52,333,000 m³ ice. HOFMANN describes the structure and velocity profile of the glacier. *Subject Headings:* **1. Glacier retreat 2. Gorge winds 3. Nisqually Glacier, Cascade Range 4. Mount Rainier.**—*C.E.P.B.*

7.4–4 551.573:551.579.4:551.577.37(942)

Royal Geographical Society of Australasia. South Australian Branch. Lake Eyre Committee, **Lake Eyre, South Australia: the great flooding of 1949–50. Report of the Lake Eyre Committee.** Adelaide, South Australia, Griffin Press, 1955. 75 p. tables, plates, refs., figs., throughout, map (fold.) at end. **GB-MO**—Contents: Price, A. Grenfell, **Introduction and Historical geography,** p. ix–xi, 1–5. Bonython, C. Warren, **Geography of Lake Eyre and its surroundings,** p. 7–9. Mason, B., **Rainfall in the Lake Eyre Catchment,** p. 11–26. Bonython, C. Warren, **The filling and drying-up,** p. 27–36. Bonython, C. Warren, **Evaporation rate,** p. 37–56. Penman, H. L., **Evaporation from Lake Eyre,** p. 57–61. Bonython, C. Warren: **Area, volume and salt content,** p. 63–68. Bonython, C. Warren, **Depression of Lake Eyre below sea level,** p. 69–70. **Flora, fauna and minerals from Lake Eyre and surroundings,** p. 71–75. Discovery (1840), exploration and geography are described. The mean rainfall is 10–17″ in the catchment area, 5″ around lake, average 1880–1948 in the catchment 11.4″. 1949(27.58″) and 1950 (28.89″) exceeded all previous records, but probably water flowed into the lake several times in last 100 years. It was full in Sept. 1950, began to fall in Oct., was practically dry by Jan. 1953, but flooded again in April. BONYTHON made detailed meteorological observations on the lake in May and Sept. 1951 and calculated evaporation rate in 1951 as 76.8″ (Dec. 11.1, June 1.2); somewhat higher values are given by PENMAN. BONYTHON also discusses area (3100 sq mi at maximum), volume (17 million ac-ft) and salinity (NaCl 71 g/l on Feb. 11, 1951, increasing to saturation (320 g/l by Jan. 1952)). *Subject Headings:* **1. Lake level fluctuations 2. Excessive rainfall 3. Evaporation 4. Lake Eyre, Australia.**—*C.E.P.B.*

BOOKS

7.4–5 551.515.2:551.501.81

Tannehill, Ivan Ray, **Hurricane hunters.** N. Y., Dodd, Mead, **1955.** 271 p. photos. Biog. note on Tannehill, following p. 271. **DLC**—An exceedingly interesting history or account of hurricane investigations from the earliest days (REDFIELD, 1821–31; REID, 1831; and PIDDINGTON, 1845) to the most recent work of the U. S. Air Force and Navy hurricane patrols (1943–55) and the men who risk their lives to learn more about these storms and to report their movements and behavior for the benefit of the public. Many famous disasters are recounted, and incidental information such as use of radar and tracer balloons, the naming of the hurricanes, the attempts to dissipate the hurricane by seeding, the nature of the "eye," typhoon narratives, early practice of ships and airplanes to avoid hurricanes (making it difficult to track them once they were discovered), and warnings issued by radio, are worked into the popular but orderly presentation. *Subject Headings:* **1. Hurricane reconnaissance 2. Hurricane research history.**—*M.R.*

7.4–6 551.594.5(02)

†Störmer, Carl, **The polar aurora.** Oxford, Clarendon Press, **1955.** 403 p. 213 figs. (incl. photos), numerous refs. throughout, tables, additional refs., p. 400–403. *International Monographs on Radio,* ed. by Sir Edward Appleton and R. L. Smith-Rose. Review by D. H.

M. in *Royal Met. Soc., Quarterly Journal*, 82(351):115, Jan. **1956. DLC**—This is the first substantial textbook on the aurora to be published in the English language by the man who has become world famous for his life's work of photographing the aurora and studying its nature. The book could well have consisted entirely of the author's own findings over 50 years, mainly through study of parallactic photographs which he himself made by a method which he devised and many others have adopted. However, there is an abundance of reference to work of others in this field, as can be seen in the numerous foot references and the added references to recent literature not cited in the text. The book is divided into two major parts which deal with: I. the descriptive aspects and II. the purely physical (atomic or molecular) and theoretical aspects. The 32 chapters cover, among other subjects: (1) forms, (2) geographical description and periodicity, (3) methods of observation and photography, (4) height determinations by visual and (5) by photographic methods, (6) measurements near the auroral belt and (7) outside the auroral belt, (8) measurements and observations in S. Norway 1911–52, (9) sunlit auroras, (10) intensity, (11) color, (12) auroral spectra, (13) spectra of sunlit aurora, (14) radio waves (10 cm) from aurora, (15) corpuscular currents outside atmosphere, (16) radio echoes from aurora, (17) Doppler studies of corpuscular stream, (18) absorption of corpuscular rays by atmosphere, (19) emission of corpuscular rays from sun. Part II, (1) differential equations, (2) results from study of differential equations, (3) families of orbits, (4) numerical integration, (5) intuitive method of control, (6) results of numerical integration (ALFVÉN's method), (7) application of theory to laboratory experiments, (8) application of theory to polar aurora, (9) limitations of theory, (10) approach of theory to actual conditions, (11) other theories (CHAPMAN-FERRARO, MARTYN and ALFVÉN), (12) other applications of research on motion of corpuscles in field of magnetic dipole: cosmic ray applications, allowed and forbidden regions, solar, magnetic and coronal relations, etc. A good author and subject index and scores of excellent original photographs are included. This is a most satisfying book—one that has been awaited 25 years. *Subject Headings:* **1. Auroras 2. Auroral theories 3. Auroral photographs 4. Auroral bibliographies 5. Textbooks.**—*M.R.*

7.4–7 551.509.39(059)

Sloane, Eric, **Almanac and weather forecaster.** N. Y., Duell, Sloan and Pearce, **1955.** 169 p. illus. Price: $3.50. **DLC**—This is a delightful "diary" of weather conditions in Connecticut and homely comments on rural life during each week of the year with profuse drawings of meteorological processes pertaining to the particular season, and an introduction giving the basic facts of 3-dimensional or synoptic meteorology for amateur forecasting or observing (also mostly in pictorial form). The book is written in the style of THOREAU's **Walden** and stands up well by comparison, both with respect to literary style and rustic philosophy. *Subject Headings:* **1. Almanacs 2. Amateur forecasting 3. Popular meteorology books.**—*M.R.*

7.4–8 551.582.1(52)

†*Vivitskiĭ, G. N., **Klimat Iaponii.** [The climate of Japan.] Moscow, Gos. Izdat. Geogr. Lit., **1954.** 175 p. 44 figs., map, numerous tables in text+22 numbered tables, bibliog. p. 172–174. **DLC**—The climatology of Japan presents an excellent account of the climate based upon the most recent climatological and meteorological studies. With the aid of extensive climatological data and numerous synoptic charts and maps with isolines of the various meteorological variables it describes the general circulation over Japan, the resulting climate by season and the climatic regions of Japan, namely the monsoon region of the temperate and subtropical zones. A special section is devoted to detailed climatic data which are presented in tables. *Subject Headings:* **1. Climate of Japan 2. Japan.**—*I.L.D.*

7.4–9 526.8(02) 551.501.6:551.582.3(02)

Monkhouse, F. J. and Wilkinson, H. R., **Maps and diagrams: their compilation and construction.** London, Methuen; New York, E. P. Dutton, **1952.** 16+330 p. 6 plates, 199 figs., numerous tables and refs. **DLC**—This book will be of great value to writers on climatology. Ch. 1, Materials and techniques, gives detailed practical instructions on drawing and lettering all types of maps for reproduction. Ch. 2, on relief maps and diagrams, is also of interest. Ch. 3, Climatic maps and diagrams, sets out in 70 p. the kinds of data which

can advantageously be represented cartographically with examples of isolines, date lines, frequency isopleths and other statistical measures, indices of aridity, etc. Diagrams inclued simple and complex columnar types, step diagrams, simple and combined line graphs to show variations with time or along a section, trend graphs including running means and integrated curves. It then takes up various types of climatograph, wind roses, and rainfall dispersion diagrams. Finally, stream lines, tracks of depressions, etc. are illustrated. The chapter is richly documented and includes 37 well chosen illustrations. The remaining chapters cover economics, population and settlements. *Subject Headings:* **1. Climatological maps 2. Climatological diagrams 3. Map preparation 4. Textbooks.**—*C.E.P.B.*

7.4–10 551.509(02)(213:5)

†*§Watts, Ian Edward Mein (*Malayan Met. Serv., Singapore*), **Equatorial weather with particular reference to Southeast Asia.** London, Univ. of London Press, **1955.** 223 p. 129 figs., tables, 78 refs. **DLC**—A new text on tropical meteorology based on experience and data from Southeast Asia and particularly Malaya. The emphasis is, naturally, on streamline, cloud and wind analysis rather than on classical Norwegian air mass analysis or the even older isobaric and isallobaric analysis still used in high latitudes. The 15 chapters are devoted to: I. Equatorial circulation, II. Surface and upper air observations, III. Upper air analysis, IV. Formation of fog and cloud in tropics, V. Strong convection and precipitation, VI. Rainfall types of SE Asia, VII. Theory of equatorial air movements, VIII. Air stream analysis, IX. Slope of air stream boundaries, X. Clouds on convergence lines and air-stream boundaries, XI. Circulation over SE Asia, XII. Samples of air stream analysis, XIII. Local disturbances, XIV. Rain forecasting, and XV. Equatorial air stream boundaries in Africa, Indian Ocean, South America and the Pacific. Appended are codes and symbols, a bibliography and subject index. The book is rich in tabular and graphic illustrative material and analyses of actual situations. *Subject Headings:* **1. Tropical meteorology 2. Tropical forecasting 3. Streamline analysis 4. Fog forecasting Southeast Asia 6. Textooks.**—*M.R*

MONOGRAPHS

See also: **Insolation and orientation—Belgium** (Dogniaux), 7.4–170; **Floods—Central Valley Basin—1950** (U. S. Geol. Survey); 7.4–247.

7.4–11 551.46:656.6

†Dremliug, Valentin Valentinovich and Ol'khovskiĭ, Vladimir Evgen'evich, **Okeanografiia na sluzhbe sovremennogo sudovozhdeniia.** [Oceanography in the service of contemporary ship navigation.] Leningrad, Gos. Izdat. Vodnogo Transporta, Leningradskoe Otd-nie **1954.** 155+5 p. 43 figs., 12 tables, bibliog. p. (157). **DLC**—A moderately technical account of the application of oceanography to various practical problems of marine navigation. The first chapter details the history of navigation and oceanography in the Soviet Union from the early beginnings of Russian seafarers in the 8th century A.D., the development of navigation schools by PETER I and the early beginnings of oceanographic studies by BERING, LOMONOSOV to the contemporary research of SHULEIKIN, ZUBOV, etc.; the various contributions of Russian oceanographers are listed briefly. The subsequent chapters are concerned with the following subjects: the problem of navigation on currents including a discussion of the origin of currents, their navigational classification, determination of velocities and directions of wind current during navigation in an open sea and near coasts, the development of navigational aids in currents, the variation of sea level and its significance in navigation with special reference to the flood and ebb-tide oscillations of sea level, etc., the importance of wave investigations to ship navigation and the construction of sea ports; influence of hydrological factors upon the propagation of sound in seas and oceans; and sea ice and navigation within ice fields and icebergs. The text is accompanied by relevant equations, tabular data and numerous diagrams and illustrations. *Subject Headings:* **1. Oceanography 2. Marine navigation.**—*I.L.D.*

7.4–12 551.510.5

Gerson, Nathaniel C., **The atmosphere.** *U. S. Air Force. Cambridge Research Center, Air Force Surveys in Geophysics*, No. 73, Sept. **1955.** 62 p. 35 figs., 4 refs. **DWB, DLC**—

A concise summary of the latest information and data on the upper atmosphere for those preparing to engage in IGY program operations or research. The 11 separate fields of (1) auroral physics, (2) ionospheric physics, (3) geomagnetism, (4) cosmic rays, (5) atmospheric structure, (6) atmospheric composition, (7) atmospheric dynamics, (8) the ionic layers, (9) airglow statistics, (10) auroral statistics and (11) geomagnetic field, are each given a 2–4 page verbal summary, and the whole supported by about 35 page-size figures showing observational data on spatial (geographic or vertical), time (hourly or seasonal), spectral or frequency distributions of the various parameters. *Subject Heading:* **1. Upper atmosphere.** —*M.R.*

7.4–13 551.521.6:546.33

Vegard, L.; Kvifte, G.; Omholt, A. and Larsen, S., **Studies of the twilight sodium lines from observations at Oslo and Tromsø, and results of auroral spectrograms from Oslo.** *Geofysiske Publikasjoner*, Oslo, 19(3), **1955.** 21 p. 4 figs., 6 plates, 9 tables. Price: 10.00 Kr. **DLC, DWB**—VEGARD's twilight method for the determination of the screening height (H_s), the upper height of the intense sodium layer (H_u) and the thickness of the sodium layer (ΔH_v) is discussed, answering recent criticism of his approach. The screening height is probably determined by absorption of ultraviolet radiation in the ozone layer. New observational results are published, giving as long-year averages $H_v = 107$, $H_s = 43$ and $\Delta H_v = 28$ km at Oslo and $H_v = 104$, $H_s = 34$ at Tromsö, where auroras disturb measurements. These heights do not have a seasonal variation but the intensity of the sodium light has a maximum in Dec. Some auroral spectrograms lead to the identification of several new bands or lines in the region 7100 to 8795 Å. A working hypothesis, regarding the sodium D-line in twilight, is proposed in an appendix. *Subject Headings:* **1. Sodium lines 2. Twilight observations 3. Auroral spectrograms 4. Oslo, Norway 5. Tromsö, Norway.**—*A.A.*

7.4–14 551.553.21

†Schick, Manfred (*Halle/Saale*), **Die geographische Verbreitung des Monsuns.** [Geographical distribution of monsoons.] *Nova Acta Leopoldina: Abhandlungen*, Leipzig, N., F. 16(112):129–257, **1953.** 14 maps, tables, 520 refs. **DLC**—This comprehensive monograph on the monsoon begins with a general description of monsoons and monsoonlike phenomena and a discussion of various climatologic techniques for studying monsoons and then proceeds with a thorough analysis of the monsoons in their geographic setting. The monsoon of the Indian Ocean and adjacent regions, of the area between China and Australia, of West Africa, the Western Hemisphere, and of the disputed monsoon regions of Central Europe and of east, northeast and north Asia are described with the aid of a map showing wind conditions and statistical data, winds and rainfall. *Subject Headings:* **1. Monsoon distribution 2. Indian Ocean 3. Asia 4. West Africa.**—*I.L.D.*

7.4–15 551.590.24

Schieldrup Paulsen, Herfinn, **On radiation, illumination, and meteorological conditions in Southern Norway during the total solar eclipse of June 30, 1954.** *Bergen, Norway. Universitetet, Arbok, 1955, Naturvitenskapelig Rekke*, No. 7, pub. **1955.** 32 p. 6 figs., 2 tables, 18 refs. **DWB, DLC**—Changes in radiation, temperature, wind and humidity were observed at weather stations in Southern Norway and on the east coast of Norway within the locality of the eclipse. The observations at each of the stations during the course of the eclipse are described with the aid of graphs showing the variations of the meteorological elements. A detailed discussion of global radiation and illumination during the eclipse is presented. *Subject Headings:* **1. Eclipse effects 2. Southern Norway.**—*I.L.D.*

7.4–16 551.510.41:546.214

*†Teichert, Friedrich and Warmbt, Wolfgang, **Ozonuntersuchungen am Meteorologischen Observatorium Wahnsdorf.** [Ozone research at the Wahnsdorf Meteorological Observatory.] *Germany. Deutsche Demokratische Republik. Meteorologischer und Hydrologischer Dienst, Abhandlungen*, 5(34), **1955.** 67 p. 29 figs., 25 tables, 84 refs. **DLC**—After reviewing briefly recent studies on the origin of ozone at the earth's surface and the history of ozone observations in Saxony, the authors present a detailed report on the ozone determinations

made thrice daily at the Wahnsdorf Observatory in 1952. The measurement technique based upon the use of KI is described and the diurnal and monthly variations are discussed in relation to the origin of ozone at the earth's surface. The quantitative and statistical evaluation of the observational data includes the following: daily and annual variation of ozone, frequency distribution of classes of ozone amounts, relationship between ozone and large-scale weather processes, ozone and wind directions, the relationship between ozone and global radiation, relative humidity, electrical conductivity of the atmosphere, and vertical temperature gradient, ozone and heat exchange, ozone amounts on days with thunderstorms, and the relationship between ozone and inversions, frontal passages and weather situations. *Subject Headings:* **1. Ozone data 2. Ozone measurement techniques 3. Ozone-weather relationships 4. Wahnsdorf Observatory, Germany.**—*I.L.D.*

MANUALS

7.4–17 551.509.1

U. S. Weather Bureau, **Manual for synoptic code (WBAN).** First ed. Effective Jan. 1, 1955. Wash., D. C., U. S. Govt. Print. Off., **1954.** 71 p. forms, map. Price: $.70 from Govt. Print. Off., Wash., D. C. **DWB**—The complete surface synoptic code effective Jan. 1, 1955, as prescribed for all U. S. Air Force, Navy and Weather Bureau (WBAN) use, with specifications, code and conversion tables needed for ordinary use. The Synoptic Code used in North and Central America (WMO Region IV) is first given in detail, then the code used in other WMO regions (I, II, III, V, and VI) including special groups; then the ship surface code and, finally, 67 code tables for the various symbols and 8 conversion tables for wind and distances. *Subject Headings:* **1. International code manuals 2. Synoptic code manuals 3. WBAN code manuals 4. International ship code.**—*M.R.*

7.4–18 551.509.1:551.557

U. S. Weather Bureau, **Manual for upper wind code (WBAN).** 1st ed., effective Jan. 1, **1955.** 31 p. (looseleaf). illus., map of WMO regions (fold.). **DWB, DLC**—A joint USWB, Air Weather Service and U. S. Navy code manual incorporating the Dec. 28 changes adopted by the WMO, CSM at Washington in April 1953, and approved by the Executive Committee of the WMO in Oct. 1953 to become effective Jan. 1, 1955 as a replacement of the 1949 Code (see 5.1–82). It is mandatory for all WBAN users. Part I defines terms, procedures, etc.; Part II, codes for upper air wind observations for U. S. stations in North and Central America (WMO Region IV); Part III, complete upper air wind code with regional variations adopted for use anywhere in world; Pt. IV, the code symbols and specifications, and 6 conversion tables. *Subject Headings:* **1. Upper wind code manuals 2. International code manuals 3. WBAN code manuals.**—*M.R.*

7.4–19 551.501.1(02)

Argentina. Servicio Meteorológico Nacional, **Nociones sobre observación meteorológica.** [Manual for meteorological observation.] Its [*Publicaciones*], *Ser. A, Sección 1,* No. 1, **1952.** 93 p. 67 figs., forms. **DWB**—A moderately detailed, illustrated manual for observing pressure, temperature, humidity, wind, clouds, precipitation, visibility, sunshine, hydrometeors, etc. The main recording and nonrecording instruments, their exposure, methods of reading and recording observations, are set forth with many schematic diagrams or drawings and reproduction of a few recorder records, observation forms, etc. *Subject Headings:* **1. Observers manuals 2. Argentine Meteorological Service 3. Meteorological instruments 4. Manuals.** —*M.R.*

GENERAL GEOPHYSICS AND METEOROLOGY

IGY, I.U.G.G. AND WMO.

7.4–20 550.3:061.3

Bartels, Julius, **Vorschau auf das Internationale Geophysikalische Jahr.** [Preview of the International Geophysical Year.] *Wetterlotse,* Hamburg, No. 93:192–200, Oct. **1955. DLC**—A very detailed description of the program for 1957–58 in all branches of geophysics. *Subject Heading:* **1. International Geophysical Year, 1957–1958.**—*C.E.P.B.*

7.4–21 551.5(26):061.3

Kuhlbrodt, E., **Kommission für Maritime Meteorologie in der Weltmeteorologischen Organisation.** [Commission for Maritime Meteorology in the WMO.] *Wetterlotse*, Hamburg, No. 93:188–191, Oct. Oct. **1955. DLC**—General account of the work of the Commission and of the meetings in Berlin (1939) and London (1952), and proposals for 1956 (in which Germany will be represented by M. Rodewald and H. U. Roll). *Subject Heading:* **1. WMO. Maritime Meteorology Commission.**—*C.E.P.B.*

7.4–22 551.501.7:061.3

Ashford, Oliver Martin, **First session of Commission for Aerology.** *World Meteorological Organization, WMO Bulletin*, 3(1):15–18, Jan. **1954.** photo. **DWB**—Discussion of aerological research and publications, cloud physics (hail prevention by cloud seeding), constants, tables and definitions, aerological diagrams and radiometeorology. *Subject Headings:* **1. Aerological research 2. WMO. Aerological Commission.**—*A.A.*

EXPEDITIONS (ARCTIC, ANTARCTIC)

See also: **British Ruwenzori Exp. 1952** (Bergström), 7.4–67.

7.4–23 91.04:016(98) 551.5:629.13

†Shelesnyak, Moses Chiam, **Across the top of the world. A discussion of the Arctic. With an Arctic Book List, by Vilhjalmur Stefansson.** Wash., D. C., Office of Naval Research, Aug. **1947.** photos, foot-refs., bibliog. p. 49–71 (136 refs.). **DWB**—A pamphlet describing conditions for living, traveling and flying in the Arctic, and describing various expeditions into the Arctic; the Arctic Research Program of the ONR (up to 1947). In addition, Stefansson presents a bibliography (arranged according to subregions) of major expeditions into various parts of the Arctic by ship, sled, air and submarine. Effects of temperature, snow, fog, ice, wind, etc. on life in Arctic are treated sketchily in the text, mainly emphasizing the lack of extremes (such as most people surmise) in the Arctic. *Subject Headings:* **1. Arctic expeditions 2. Arctic aviation 3. Arctic bibliographies. I. Stefansson, Vilhjalmur.**—*M.R.*

7.4–24 551.501.9(98)

Our Arctic underground. The AF's sub-zero heroes. *Air Force*, Dayton, Ohio, 38(1): 28–31, Jan. **1955.** photos. **DWB**—Underground weather stations used on the Greenland Ice Cap are built of large galvanized steel culvert tubes which float on the snow and sink at a slow rate until eventually covered. Personnel use escape hatches to reach surface. These are extended upward as quarters sink or snow piles up. Conditions in living quarters are comfortable (72°F); temperatures in storage areas for perishables are 40°F and for frozen foods 10° to 20°F. Outdoor operations and interiors are illustrated. *Subject Headings:* **1. Arctic weather stations 2. Underground weather stations 3. Greenland Ice Cap.**—*M.R.*

7.4–25 551.311.184

Floating ice island will be occupied soon. *Science News Letter*, 67(17):265, April 23, **1955. DWB**—The 9 mi long ice mass known as T-3 or Fletcher Island will be reoccupied in Sept. 1955 by a U.S.A.F. scientific team. The purpose is to determine whether the ice mass is land-locked or whether its drift along the Greenland coast is being maintained. The scientific work will include surface and subsurface observations of various types. *Subject Headings:* **1. Arctic Ice Island (T-3) 2. Floating ice islands.**—*W.N.*

7.4–26 551.501.9(99)

Antarctic observation stations. *Science*, Wash., D. C., 122(3162):234, Aug. 5, **1955. DLC, DWB**—U.S.S.R. will establish three stations in Antarctica, one near the South Pole. The U. S. and U.S.S.R. are the only countries which will establish bases on the Knox Coast and Princess Astrid Coast of Antarctica. Bases to be occupied by other nations are mentioned. *Subject Headings:* **1. Antarctic weather stations 2. Antarctica.**—*M.R.*

7.4–27 55:06(99) 551.501.9

Sullivan, Walter, **Winter base set for Antarctica.** *N. Y. Times*, July 11, **1955,** Section C, p. 25. diagr. **DLC**—Report on decisions announced at the "Antarctic Conference" which ended July 10, 1955. Map shows where British hope to set up a base 300 mi south of Vahsel Bay and New Zealand one 300 mi south of McMurdo Sound on glaciated plateau near South Pole. The U. S. will man a station at the Pole, the Soviet Union at the geomagnetic pole, where the theoretical field pierces the earth's crust, and France at the magnetic pole (where the force is vertical). France and Australia will have stations 100 or more miles inland from their coastal bases and the Soviet Union one between Knox Coast and the Pole. *Subject Headings:* **1. Antarctic Conference—Paris, July 1955 2. Geophysical stations 3. International Geophysical Year, 1957/58 4. Antarctica.**—*M.R.*

OBSERVATORIES

7.4–28 551.501.9:551.43(437)

Visinski meteorološki opservatorij Lomnicki Štit u Čehoslovačkoj Republici. [Lomnicky Štit Mountain Observatory in Czechoslovakia.] *Split, Yugoslavia. Hidrografski Institut Mornarice. Meteorološki Otsjek, Vremenske Prilike*, 3(1/2):46–47, July **1948.** 2 photos. **DWB**—Structure and instruments of the Lomnicky Štit Observatory are described. Beside the conventional instruments the observatory is equipped with a Fuess universal anemograph, a Dines anemograph, a Tycos microbarograph, a Robitzsch actinograph, a Fuess ombrograph, a Campbell-Stokes heliograph, a Stade-Beckel heliograph, a katathermometer and a pilot balloon outfit. The observatory is built of ferro-concrete. It is accessible by railway. *Subject Headings:* **1. Mountain observatories 2. Lomnicky Štit Observatory 3. Lomnic Peak, Tatra Mountains, Czechoslovakia.**—*G.T.*

7.4–29 551.501.9:551.551

Rösch, Jean, **Sur l'application de l'étude de l'agitation atmosphérique par la méthode de Hartman au choix d'un emplacement d'observatoire.** [Investigation of atmospheric turbulence by Hartman's method for the choice of an observatory site.] *Académie des Sciences, Paris, Comptes Rendus*, 239(3):222–224, July 19, **1954.** 2 figs., 2 refs. **DWB**—For measurement of small-scale atmospheric wave motions to be expected at an instrument site, the author recommends the use of an apparatus consisting of a system of mirrors and lenses arranged over an area of one square meter, approximately. The instrument would be useful in selecting the proper location for astronomical telescopes; it could be mounted on a trailer as a mobile unit. *Subject Headings:* **1. Instrument exposure 2. Micrometeorological instruments 3. Micro-oscillations.**—*G.T.*

7.4–30 551.501.9(09)

Germany. Deutscher Wetterdienst in der US-Zone, **Die Fünfzigjahrfeier des Observatoriums Zugspitze, 29.IX–1.X.1950.** [Celebration of the 50th anniversary of the Zugspitze Observatory on Sept. 29–Oct. 1, 1950.] Its *Berichte*, No. 31, **1951.** 26 p. 6 figs., refs. **DWB**—The history and present activities of the observatory are summed up in an introductory article and in speeches addressed to an audience commemorating the anniversary. A list of guests and photos of several of them are given. The report also includes three scientific lectures delivered during the festivities, namely: 1. "Air avalanches," by A. Schmauss, dealing with the phenomenon of katabatic winds which result when small air masses gradually and continuously accumulate in valleys in high altitude and are suddenly detached at regular times; 2. Abstract of a lecture on "The climate of high mountains," by C. Troll, in which climatic characteristics of high mountains at various latitudes are discussed; and 3. "High mountains and general circulation," by H. Flohn, on aerological and dynamic effects of mountains and seasonal and secular variations in the general circulation, with explanatory data presented in graphs and charts. Several references are attached to lectures 2 and 3. *Subject Headings:* **1. History of observatories 2. Zugspitze Observatory 3. Zugspitze, Germany.** —*G.T.*

SERVICES

7.4–31 551.501.9(46) 550.3(46)

Actividad de los observatorios Españoles durante el año 1953. [Activity of the Spanish observatories during 1953.] *Urania*, Barcelona, 39(238):190–197, July/Sept. **1954. DWB**—Includes meteorological activities, among others, and publications of Observatorio Geofisico de Cartuja, at Granada; Observatorio del Ebro, at Roquetas-Tortosa; the Observatorio Astronomico of the Universidad at Santiago de Compostela; the Observatorio Fabra at Barcelona; the Observatorio of the Universidad at Barcelona; the Observatorio Astronomico Nacional at Madrid; and the Instituto y Observatorio de Marina at San Fernando. *Subject Headings:* **1. Observatories 2. Geophysical observatories 3. Spain.**—*D.M.G.*

7.4–32 551.5:016(98,71)

†National report on Canadian meteorological research 1951–1954. *I.U.G.G. Bulletin d'Information*, 3(6):231–241, July **1954.** bibliog. p. 237–241 (109 refs.). **DWB**—Work done in Canada along the following lines: practical meteorology, mechanics and thermodynamics, radiation and ozone, water vapor and hydrometeors, Arctic meteorology, climatology and instruments is summarized, and 109 references to literature sources cited under those headings in the carefully prepared bibliography. *Subject Headings:* **1. Meteorological research 2. Bibliography of Canadian meteorological literature 3. Arctic meteorology 4. Canada.**—*M.R.*

7.4–33 551.5:06(058)

†Germany. Meteorologisches Amt für Nordwestdeutschland, **Bericht über die Tätigkeit, 1945/1949, 1950.** [Report on activity, 1945/1949 and 1950.] Pub. Hamburg. 2 pieces. (74+24 p.) diagrs., numerous refs. **DWB**—The 1945/49 Report summarizes activities, personnel, networks, service, etc. for the period of rehabilitation of the British zone service in the same style as the 1951 and 1952 reports. Marine, agricultural, aviation, forecasting, instrument and climatological as well as administrative matters are treated at length. Charts show location of stations in various networks. Lists of publications and works of separate authors published in journals are included in each report. (For 1951 issue, *see* 4.5–16, May 1953; for 1952 issue, *see* 5.11–12, Nov. 1954, *MAB.*) *Subject Headings:* **1. Annual service reports 2. Administrative reports 3. Northwest German Weather Service 4. Northwest Germany.**—*M.R.*

7.4–34 551.5:06

*Germany. Deutscher Wetterdienst, **Mitteilungsblatt des Deutschen Wetterdienstes.** [Bulletin of the German Weather Service.] Its *Mitteilungsblatt*, 2(8):157–183, Aug. **1954. DWB**—A regular report on the economic aspects of the German Weather Service in the West Zone, and the activities of the various branches of the service (industrial, agricultural, aviation, marine, instrument and library). *Subject Heading:* **1. German Weather Service.**—*M.R.*

EDUCATION, HISTORY AND BIOGRAPHY

EDUCATION

See: **Oceanographic education** (Fleming, Barnes), 7.4–52.

BIOGRAPHY

7.4–35 551.5:92

Dr. James Esmond Belasco [Obituary]. *Meteorological Magazine*, London, 82(972):189, June **1953. DWB**—Died April 16, 1953, aged 58, after service in Meteorological Office since 1916. Wrote several papers mainly on characteristics of air masses. *Subject Headings:* **1. Obituaries 2. Belasco, James Esmond.**—*C.E.P.B.*

7.4–36 551.5:92

Gold, E., **Obituary [of] Prof. A. B. Dobrowolski.** *Nature*, London, 173(4415):1121, June 12, **1954. DWB**—Antoni B. Dobrowolski, Polish meteorologist and hydrologist,

was born in 1872, and educated at Zurich and Liège. Joined "Belgica" Antarctic expedition in 1897, concentrating on observations of cloud and of snow and ice in the atmosphere, originating the idea of "cloud systems." Published **The Natural History of Ice** (Polish, 1923). Director of Polish National Meteorological Institute 1924–29. *Subject Headings:* **1. Obituaries 2. Dobrowolski, A. B.**—*C.E.P.B.*

7.4–37 551.5:92

Stenz, Edward, **Professor Dr. Romuald Gumiński (wspomnienie pośmiertne).** [Obituary of Prof. Dr. Romuald Gumiński.] *Przegląd Meteorologiczny i Hydrologiczny*, Rocznik, 5(3/4): 3–8, **1952.** (Includes list of publications by Romuald Gumiński.) **DWB**—An obituary of the late assistant director of the State Meteorological and Hydrological Institute, Editor and Professor of Climatology at Warsaw University and member of many scientific organizations. Born in Warsaw 1896, died Oct. 26, 1952. He wrote 50 papers and two textbooks—one a course in meteorology and climatology and one on meteorology and climatology for agriculture. *Subject Headings:* **1. Obituaries 2. Gumiński, Romuald.**—*A.M.P.*

7.4–38 551.5:92

Professor Sir Ernest Maclagan Wedderburn, O.B.E., D.L., M.A., LL.D., D.Sc., F.R.S.E. *Weather*, 10(11):375–376, Nov. **1955.** photo. **DWB**—Born in Forfar, educated at Edinburgh. In charge of meteorological unit in E. Mediterranean 1914, then worked on application of meteorology to gunnery. After 1914–18 war returned to legal practice, but retained interest in Scottish meteorology. *Subject Headings:* **1. Biography 2. Wedderburn, Sir E.** —*C.E.P.B.*

BIBLIOGRAPHY

7.4–39 551.481.1:016

†Verber, James L., **Bibliography of physical limnology, 1781–1954.** *Ohio. Dept. of Natural Resources, Report of Investigations*, No. 25 (Contribution No. 4, Lake Erie Geological Research Program), **1955.** 57 p. **DWB**—This is both a bibliography and a subject index of the literature on the physical limnology of the Great Lakes. The references are listed alphabetically, and the publications of each author are arranged chronologically according to year of publication. The subject index "is keyed to the literature cited in the Bibliography by authors' last names and publication date." *Subject Headings:* **1. Bibliography on physical limnology 2. Limnology. I. Ohio. Dept. of Natural Resources. Div. of Shore Erosion II. Ohio. Dept. of Natural Resources. Div. of Geological Survey.**—*I.L.D.*

7.4–40 551.579:016

†International Union of Geodesy and Geophysics. Association of Scientific Hydrology, **Hidrológiai bibliográfia 1945–1954 Magyarország.** [Hydrological bibliography, Hungary, 1945–1954.] Budapest, Műszaki könyvkiadó, **1955.** 180 p. 780 refs. At head of t-p: Országos Vízügyi Főigazgatóság. Vízgazdálkodási Tudományos Kutató Intézet (Rudolf de Chatel (*ed.*)). **DLC**—This is Hungary's first contribution to the series of bibliographies on hydrology initiated by the I.U.G.G. Association of Scientific Hydrology (for contributions of other countries, *see items* 6A-78, 6A-85, 6A–102 and 7.1–73, Jan. 1955 and Jan. 1956, *MAB*). Books, monographs and articles published in Hungary or published by Hungarian authors in other countries are listed in the arrangement suggested by I.U.G.G.: 1) Hydrometeorology, 2) Rivers, 3) Lakes, 4) Glaciers, 5) Subterranean water, 6) Hydrologic cycle, 7) Applications of other sciences to hydrology, 8) General works, 9) Miscellaneous. The section on hydrometeorology (precipitation, snow, evaporation and humidity, applications) contains 90 references. The total number of references is 780. They include: a) name of author, b) title in Hungarian, Russian and a third language (English, French or German) and c) Source. A list of periodicals and serial publications used and an author index complete the volume. *Subject Headings:* **1. Hydrology bibliographies 2. Hydrometeorology.**—*G.T.*

7.4–41 551.510.534:016

†Belmont, Arthur D. (*Dept. of Geog., McGill Univ., Montreal*), [**Ozone bibliography as of December 1950.**] p. 23–31 of typed manuscript. Original ms. on file, c/o Prof. Robert R.

Holzer, Institute of Geophysics, University of California at Los Angeles. Entries arranged chronologically from 1950 to 1948, and 1947 and before. —One hundred twenty-six references selected from recent literature are cited without annotations. *Subject Heading:* **1. Ozone bibliographies.**—*M.R.*

7.4–42 551.5:016 550.3:016 551.46

†**Canadian Geophysical Bulletin,** Ottawa, vol. 7, Dec. **1954.** p. 38–50, Thomson, A., **Meteorology and Hydrology.** 61 refs. and list of 6 papers for presentation at Rome (I.U.G.G.) Conference. p. 51–58, Madill, R. G., **Terrestrial magnetism and atmospheric ionization.** diagr., 22 refs. p. 59–67, Hachey, H. B., **Oceanography.** 31 refs. **DLC, DWB**—Canadian participation in the Rome meeting of the I.U.G.G. and in the coming IGY, 1957–58 is emphasized. Lack of graduate students who are qualified to work in Geophysics is deplored. In the bibliography under Geodesy, Pt. I, there are a number of references to papers on refraction in the lower atmosphere. In Pt. III (Meteorology & Hydrology) the research in radiation, ozone, water vapor, cloud seeding, arctic meteorology, climatology, instruments, hydro-meteorology, air pollution and glaciers is summarized. Terrestrial magnetism, auroras and ionospheric studies are the subject of discussion and bibliography in Pt. IV. *Subject Headings:* **1. Geophysical research 2. Meteorological research 3. Bibliography of Canadian geophysical literature 4. Oceanography 5. Canada.**—*M.R.*

HISTORY

7.4–43 551.5(09)

Lempfert, R. G. K., **Fifty years of meteorology: some recollections.** *Royal Meteorological Society, Quarterly Journal,* 81(350):600–602, Oct. **1955. DWB**—Chatty history of the British Meteorological Office and Royal Meteorological Society from 1902 to 1920, from personal recollections. *Subject Headings:* **1. History of meteorology 2. British meteorological service.** —*C.E.P.B.*

PRACTICAL AND APPLIED METEOROLOGY

MARINE METEOROLOGY AND OCEANOGRAPHY

7.4–44 535:551.463:551.521.14

Cox, Charles and Munk, Walter (*Scripps Inst. of Oceanog.*), **Some problems in optical oceanography.** *Journal of Marine Research,* New Haven, Conn., 14(1):63–78, June **1955.** 8 figs., 16 refs., 26 eqs. **DWB, DLC**—Problems involving the refraction and reflection of light from sun and sky by a *roughened* sea surface have been made accessible to numerical treatment by measurements of the probability distribution of sea surface slopes. Four cases are treated. (1) The refracted sun's glitter, as seen from beneath the surface. It is smaller but about 1000 times more luminous (neglecting absorption) than the reflected glitter, and, unlike the reflected glitter, it expands and dims as the sun sets. (2) The albedo of a rough surface to direct sunlight. It is slightly larger at high sun angles and substantially smaller at low sun angles than the albedo of a flat surface. Accordingly, more solar energy penetrated Arctic waters than had been estimated previously and the amount of this additional energy depends upon wind speed. (3) The luminosity and albedo of a rough sea surface due to sky light. At the horizon a rough surface is darker than a smooth surface, thus enhancing the horizon contrast. The albedo of the sea surface to sky light varies from 5 to 10%, depending on the distribution of illumination from the sky; it is largest when the sea is flat calm. The roughening by a Beaufort 4 wind reduces the albedo by about 20%. (4) The visibility of slicks. *Subject Headings:* **1. Optical properties of sea water 2. Albedo of sea surfaces.**—*Authors' abstract.*

7.4–45 535.43:551.46.018:77

Cox, Charles and Munk, Walter (*Scripps Inst. of Oceanog., La Jolla*), **Measurement of the roughness of the sea surface from photographs of the sun's glitter.** *Optical Society of America, Journal,* 44(11):838–850, Nov. **1954.** 8 figs., table, 12 refs., 18 eqs. **DLC**—A

method is developed for interpreting the statistics of the sun's glitter on the sea surface in terms of the statistics of the slope distribution. The method has been applied to aerial photographs taken under carefully chosen conditions in the Hawaiian area. The mean square slope increases linearly with the wind speed reaching a value of $(\tan 16°)^2$ for a wind speed of 14 m sec^{-1}. The ratio of the up/downwind to the crosswind component of mean square slope varies from 1.0 to 1.9. There is some up/downwind skewness which increases with increasing wind speed. As a result the most probable slope at high winds is not zero but a few degrees, with the azimuth of ascent pointing downwind. The measured peakedness which is barely above the limit of observational error, is such as to make the probability of very large and very small slopes greater than Gaussian. The effect of oil slicks covering an area of $\frac{1}{4}$ sq mi is to reduce the mean square slopes by a factor of two or three, to eliminate skewness, but to leave peakedness unchanged. (For fuller reports, *see item* 5K-134, Nov. 1954, *MAB.*) *Subject Headings:* **1. Ocean wave measurement 2. Aerial photography.**—*From authors' abstract.*

7.4–46 551.46:018 551.508

†Munk, Walter H., **Air-sea boundary processes.** *National Research Council, Washington, D. C., Publication*, No. 309:210–224, **1952.** table, fig., refs. Montgomery, R. B., **Discussion,** p. 220–221. **DLC**—Munk discusses a number of problems which are being investigated by oceanographers, and for which instruments are inadequate or not available. Solar radiation, glitter, wave slope, momentum flux, and evaporation are a few of the elements discussed by Munk, Reid, Woodcock and Montgomery. Reid presents a table summarizing the instruments capable of recording continuously over the ocean the temperature, humidity, velocity, salinity and radiation with principle on which each type of instrument is based, probable error, time response factor, and references to literature, tabulated after name of each instrument. *Subject Headings:* **1. Oceanographic instruments 2. Air-sea boundary measurements 3. Ocean-atmosphere investigations.**—*M.R.*

7.4–47 551.465

Munk, Walter (*Scripps Inst. of Oceanog., La Jolla*), **Circulation of the oceans.** *Scientific American*, N. Y., 193(3):96–104, Sept. **1955.** figs. **DWB, DLC**—The system of ocean currents in relation to wind belts and to the chemical and biological properties of ocean regions, the possible mechanism by means of which winds produce the oceanic circulation gyres, and the destinction between and investigation of the climatic and synoptic oceanic circulations are discussed. Charts show the climatic circulations in the ocean basins. The Gulf Stream circulations and the Antarctic circulations are presented. *Subject Heading:* **1. Oceanic circulation.**—*I.L.D.*

7.4–48 551.461.2

†Pattullo, June; Munk, Walter; Revelle, Roger and Strong, Elizabeth (*all, Scripps Inst. of Oceanogr.*), **The seasonal oscillation in sea level.** *Journal of Marine Research*, New Haven, Conn., 14(1):88–155, **1955.** 5 figs., 3 maps (fold.), 3 tables, 43 refs., 15 eqs. **DWB, DLC**—On the basis of all available tide gauge records, bathythermograms, and Nansen bottle casts, we have compiled, on a global scale, monthly departures of *recorded* and *steric* sea levels from their annual means. The steric fluctuation is defined in terms of the seasonal fluctuation in specific volume. The results are given in the appendices and in three charts, together with error estimates. In general, the departures are comfortable above the uncertainties introduced by year to year variations and by the effects of local topography. Recorded and steric departures agree remarkably well in low and temperate latitudes (conditions are *isostatic*). In these regions the steric levels are associated largely with temperature fluctuations in the upper 100 m. In high latitudes conditions are indeterminate. Pronounced semiannual fluctuations are found along the west coast of South Africa, in Indonesia, in corresponding regions of the Labrador and Oyashio currents, and in the Gulf of Mexico and adjoining Gulf Stream stations (but not in the Kuroshio!). Elsewhere the oscillations are largely annual in character, with low sea level in each Hemisphere during its spring and with high level during the fall. Recorded amplitudes vary from a few centimeters in the tropics to a few decimeters at higher latitudes; they exceed one meter in the Bay of Bengal. Atmospheric pressure effects and long

period astronomic tides account for only a small part of the recorded fluctuations. *Subject Headings:* **1. Sea level variations 2. Ocean currents 3. Bathythermograms 4. Atmospheric tides.**—*Authors' abstract.*

7.4–49 551.465:551.468

Defant, Albert, **Die Strömungen in Meeresstrassen.** [Currents through straits.] *Deutsche Hydrographische Zeitschrift*, 8(1):1–15, **1955.** 11 figs., 2 tables, 11 refs., 28 eqs. German, English and French summaries p. 1. **DWB**—The stratification and currents through a strait are calculated by the equations of motion from the dimensions of the strait and the density of water on either side. The calculated positions of the boundary surfaces between the boundary current, undertow and bottom layer in the Belt, Bosphorus, Dardenelles and Straits of Gibraltar and Bab-el-Mandeb, and the spreading out of the Mediterranean water as an intermediate layer of high density in the North Atlantic, agree well with observations. *Subject Headings:* **1. Ocean currents 2. Straits.**—*C.E.P.B.*

7.4–50 551.556:551.465

Bernard, F. (*Prof. Faculté des Sciences, Alger Univ.*), **Action des vents sur le courant Atlantique en Méditerranée.** [Action of the winds on the Atlantic current in the Mediterranean.] *I.U.G.G. Association of Physical Oceanography, Rome, Sept.* 14–25, 1954, *Procès-Verbaux.* Bergen, **1954.** p. 249–250. **DWB**—Results of a study of the permanent Atlantic current flowing through Gibraltar into the Mediterranean Sea based on more than 2000 sea water samples taken between 1950 and 1953 at various depths (from 0 to 500 m) 3 to 50 mi off shore along the coast. Water temperature, salinity, and content of phosphate, nitrate and plankton were determined. It has been found that while off Nemours (d'Alboran Sea) the water is almost oceanic with any direction of wind, the percentage of Mediterranean water increases greatly to the east between Aran and Dellys (500 km extent) and is clearly influenced by the direction of mean winds blowing during the 48 hours before the sampling. The variation is from 15 to 34% depending on the force and direction of the wind, which affect also the depth and the width of the Atlantic current. *Subject Headings:* **1. Wind driven currents 2. Atlantic current 3. Mediterranean Sea.**—*A.M.P.*

7.4–51 551.556:525.6:551.465

Bowden, K. F. (*British Nat. Inst. of Oceanog.*), **Effect of wind on tidal currents.** *I.U.G.G. Association of Physical Oceanography, Rome, Sept.* 14–25, 1954, *Procès-Verbaux.* Bergen, **1954.** p. 223–224. **DWB**—Characteristics of drift currents in the Strait of Dover, which are closely related to changes in sea level produced by wind, were investigated from Feb. 1953–March 1954 by measurements of the voltage on a submarine cable across the Strait. The voltage recorded is proportional to the average velocity of flow across a vertical section. The drift currents found by eliminating the already known magnitude of the tidal currents were correlated with the local wind and the slope of the sea surface, as deduced from tide gage records. It was found that the flow is influenced more by the differences in sea level than by local wind. The differences in level are, however, due to the effect of winds over large areas as a whole. *Subject Headings:* **1. Wind effects on currents 2. Tidal currents 3. Strait of Dover.**—*A.M.P.*

7.4–52 551.46:37

Fleming, Richard H. and Barnes, Clifford A., **Oceanographic program of the University of Washington.** *I.U.G.G. Association of Physical Oceanography, Rome, Sept.* 14–25, 1954, *Procès-Verbaux.* Bergen, **1954.** p. 154. **DWB**—The Dept. of Oceanography, established in 1951, is offering both undergraduate and graduate programs. Active surveys and research are conducted in the Northeast Pacific and in the inshore waters (non-permanent water movements, mechanism of water exchange) on board the 115 ft long vessel, "Brown Bear." Field observations and theoretical analyses are supplemented by studies on a tidal model of inshore waters. Several projects involving engineering applications of oceanography have been completed. *Subject Headings:* **1. Oceanographic research 2. Washington University, Dept. of Oceanography 3. Oceanographic education.**—*A.M.P.*

AERONAUTICAL METEOROLOGY

See also: Items 7.4–81, 7.4–82, 7.4–84 and 7.4–145.

7.4–53 551.508:629.13

Majendie, A. M. A., **Instrument requirements for civil aircraft.** *Institute of Navigation, London, Journal*, 8(1):17–25, Jan. **1955. DWB**—Among other instruments, the paper deals briefly with indicators of normal acceleration and pressure altimeters. *Subject Heading.* **1. Aviation instruments.**—*C.E.P.B.*

7.4–54 551.5:629.13

Rendel, D., **Some effects of the weather on aircraft design and operation.** *Weather* 10(9):288–293, Sept. **1955.** fig., 2 photos. **DWB**—Begins with a simple explanation of icing and methods of dealing with it. Obscuration of wind screen by rain can be partly overcome by jet of air in front of the screen normal to the direction of flight. Erosion of leading edges by rain is discussed. Air conditioning of cabins, misting of transparencies on descent and effect of temperature on aircraft materials are briefly considered. *Subject Headings* **1. Weather effects 2. Aircraft design.**—*C.E.P.B.*

7.4–55 551.5:629.13

World wide weather. *Flying Safety*, Wash., D. C., 10(10):1–7, Oct. **1954.** illus. **DWB**—The most dangerous weather conditions for flying in various parts of the U. S., Alaska, Japan, Korea, the Philippines, North Africa, Arabia, Spain, France, England, Germany, Greenland and the Caribbean Region are discussed briefly for each region, with special emphasis on fall and winter conditions. The purpose is to give the pilot an idea of the general conditions, especially those most difficult to forecast, that he might encounter when flying in unfamiliar regions or parts of the earth. *Subject Headings:* **1. Flying weather 2. Winter flying hazards I. Breen, Gerald.**—*M.R.*

AGRICULTURAL METEOROLOGY

See also: **Radiation climate** (Stolley), 7.4–78; **Microclimate . . . of an irrigated field** (Chudnovskiĭ), 7.4–266; **Micromet. study in a vineyard** (Nehara), 7.4–267.

7.4–56 551.556.

Maruyama, Eizo and Yamamoto, Yuzo (*both, Central Met. Obs.*), **On the role of the bamboo blades as a windbreak in farm field.** *Journal of Agricultural Meteorology*, 9(2):56–58, March **1954.** In Japanese; English summary p. 58. 2 figs., 4 tables. **MH-BH**—In this study of the microclimate created by bamboo blades used as a windbreak, the authors measured air temperature 2 cm, 5 cm and 10 cm above the ground and wind speed at ground level. The results of the measurements are given in tables and graphs. *Subject Headings:* **1. Bamboo windbreaks 2. Windbreak effects.**—*I.L.D.*

7.4–57 63(81)

Sternberg, Hilgard O'Reilly, **Agriculture and industry in Brazil.** *Geographical Journal*, London, 121(4):488–502, Dec. **1955.** 7 figs., 6 photos, 39 refs. **DWB**—The economics of agriculture in Brazil are discussed. Maps are given of coffee crops (1920, 1940, 1950), sugar cane and cotton. Southwards the coffee crop is limited by frost; other climatic difficulties, erosion, etc. are described. Hydro-electric power offers possibilities. *Subject Heading.* **1. Agriculture of Brazil 2. Brazil.**—*C.E.P.B.*

7.4–58 551.5:63(09)

Burgos, J. J., **The development of agricultural meteorology.** *World Meteorological Organization, WMO Bulletin*, 3(1):10–14, Jan. **1954.** photo. **DWB**—A general discussion of the history of meteorology and climatology and the place of agricultural meteorology within these sciences. *Subject Headings:* **1. Agricultural meteorology 2. History of meteorology.** —*A.A.*

7.4–59 551.5:6

Wray, Gustavo H. (*Met. Serv. of Ecuador*), **Importancia de los estudios climáticos en relación con el cultivo de cacao en el Ecuador.** [Importance of climatic studies in relation

o the cultivation of cacao in Ecuador.] *Boletín de Informaciones Científicas Nacionales*, Quito, 5(40):234–257, Aug./Sept. **1952.** tables, charts, diagr. Abstracted from reprint. **DWB**—Meteorological data in this study include a pluviogram of Guayaquil for the period 1915–1951, the Cacao Renewal Project's charts on normal values of precipitation, temperature and humidity in the Guayas basin and tabulated data on annual temperature in Guayaquil, seasonal maximum and minimum temperatures, and March and Nov. humidity values for various regions. These data are analyzed as to their proficiency in respect to cacao cultivation. With this purpose in view a climatic chart of the Guayas basin is presented. *Subject Headings:* **1. Agricultural meteorology 2. Cacao cultivation 3. Ecuador.**—*G.T.*

FOREST METEOROLOGY

See also: **Forest met.** (Alexander, Buell), 7.4–211; **Microclimatic investigations** (Alisov), 7.4–212; **Windbreak effectiveness** (Matsui, Shinohara), 7.4–213; **Windbreak effectiveness** (Onodera et al.), 7.4–214; **Shelter hedge effect** (Tani), 7.4–215; **Forest transpiration** (Ivanov et al.), 7.4–222; **Forest types** (Ivanov), 7.4–223; **Microclimatic observations** (Kullenberg), 7.4–269; *also* 7.4–243, 7.4–268, 7.4–270.

7.4–60 551.588.6:519.241.1

Primault, Bernard and Kuhn, Walter (*Zürich*), **De l'opportunité d'utiliser les coefficients de corrélation en météorologie forestière.** [On application of correlation coefficients in forest meteorology.] *Geofisica Pura e Applicata*, 28:246–260, **1954.** French, Italian, German and English summaries p. 246–247. 2 figs., 10 tables, 7 refs., eqs. **DWB**—The present paper is a complement to an earlier work. Its purpose is to investigate the utility of correlation calculus with regard to ecological problems especially of the forest-meteorological kind. The authors computed, first of all, the direct correlation between tree growth and each of 12 meteorological quantities. They tried then to improve the results by referring the annual tree growth to its regression line instead of the mean. Finally, they examined partial correlation taking into account two meteorological influences at the same time. The results seem to indicate that there is no statistical evidence for any significant correlation between tree growth and meteorological data. This is of course contrary to practical experience, whence the authors infer, that correlation calculus is an inadequate tool for handling their problem and similar ecological researches. This conclusion is supported by physiological considerations. *Subject Headings:* **1. Forest meteorology 2. Correlation coefficients 3. Tree growth.**—*Authors' summary.*

7.4–61 551.5:632.187

Fire hazard in Southeast. *Science News Letter*, 66(17):268, Oct. 23, **1954.** photo on cover p. **DLC**—Brief news item based on an interview with Carl A. Gustafson, chief of U. S. Forest Service's Fire Control Section. Moisture deficiency in forests of the southeastern U. S. is reported at near-critical forest fire level. Fire fighting methods used in various parts of the U. S. are described. *Subject Headings:* **1. Fire weather conditions 2. United States.**—*G.T.*

7.4–62 551.5:634.9

Bonacina, L. C. W., **British forest trees in the weather scene.** *Weather*, 8(8):237–242, Aug. **1953.** **DWB**—Notes on habitat of oak, ash, beech, pine, birch and elm and their part in scenery. *Subject Headings:* **1. Forests 2. British Isles.**—*C.E.P.B.*

7.4–63 551.509.584

*Cramer, Owen Putnam, **1954 forest fire weather in Western Oregon and Washington.** *U. S. Forest Service. Pacific Northwest Forest and Range Experiment Station, Research Note*, No. 106, Nov. **1954.** 5 p. 2 tables, 3 refs. **DWB.** Also his: **Fire weather in Western Oregon and Western Washington in 1952 compared with other years.** *U. S. Forest Service. Pacific Northwest Forest and Range Experiment Station, Research Note*, No. 86, July **1953.** 5 p. 6 figs., ref. **DWB.** Both papers also in: U. S. Weather Bureau, [**Papers presented at the Fire Weather meeting, Portland, Ore., Feb. (March?), 1955.**] **DWB**—Summary for year of conditions in Western Oregon and Western Washington with tables, comparing spring,

summer, and fall conditions for current, previous, and ten-year average. Summaries includ discussion of seventy of the fire conditions in the summer as rated by: (1) No. of rainless days (2) No. of days since a wetting rain of ¼ in. or more and (3) burning index (combined relativ humidity and wind speed). Graphs show comparatively year by year conditions for 1928– 1952 for Western Oregon and Western Washington. *Subject Headings:* **1. Fire weathe reports 2. Burning index data 3. Western Oregon 4. Western Washington.**—*M.R.*

7.4–64 551.509.58

Lanning, John M. (*WBAS, San Francisco*), **Objective aid for forecasting high fire dange in the area surrounding the San Francisco Bay.** S. Francisco, Fire Weather Unit, W.B.A.S March **1955.** (In: U. S. Weather Bureau, [**Papers presented at the Fire Weather meeting Portland, Ore., Feb. (March?), 1955.**] 2 p. 2 charts.) **DWB**—In an attempt to provid the busy forecasters on duty in the morning at San Francisco with an objective aid to spo situations which call for fire danger warnings in the immediate vicinity of San Francisco Bay the author has prepared 2 scatter diagrams, based on 1953–54 data and tested against 195 data, using: (1) pressure gradient between Reno and San Francisco as one variable and win speed and direction at Grizzly Peak, Fairfield and Sacramento as the other and (2) wind an pressure gradient values from Chart 1 combined against height of stratus tops in feet. Th latter chart has an area in the southwest corner that embraces most of the cases with hig fire danger, and only 2 cases with local fire danger only. A second area includes several mor high fire danger and local fire danger situations and a few with low fire danger. This char should give good results. Absence of marine air is the dominant factor. *Subject Headings* **1. Fire weather studies 2. Objective fire danger forecasting 3. San Francisco, Calif. area** —*M.R.*

7.4–65 632.18

Mitchell, J. A., **Mortality from fire in Jack pine stands.** *U. S. Forest Service, Lake State Forest Experiment Station, Technical Note,* No. 416, April **1954.** table. **DWB**—The averag percent of Jack pine damage killed by surface fires is analyzed in relation to wind velocit and season. Summer fires were found to do more damage than spring fires and damag increases with wind velocity. *Subject Heading:* **1. Forest fires.**—*I.L.D.*

7.4–66 551.509.58

*†Hibbard, Charles, Jr. (*U.S.W.B., Olympia, Wash.*), **Lightning storms in Western Washington.** Paper dated May 1, **1954.** (In: U. S. Weather Bureau, [**Papers presented at th Fire Weather meeting, Portland, Ore., Feb. (March?), 1955.**] 7 p. 2 figs., 4 tables, 9 refs. **DWB**—An empirical study of factors affecting development of lightning storms in the forest of western Washington gives data on thunderstorm frequency, May–Sept. in several areas an 11 favorable factors and 4 unfavorable factors. Surface pressure, stability, temperature rang at 850 and 700 mb, surface dew points, 850 mb relative humidity at Tatoosh Island and windi aloft, fronts, air masses, 700 mb, streamlines and troughs are considered. Difference betwee districts and time of occurrence of storms are discussed. The most favorable conditions ar thermal troughs moving from west to east of Cascades, southerly winds west of Cascades an high 850 mb temperatures. *Subject Headings:* **1. Fire weather studies 2. Objective lightning forecasts 3. Lightning storm frequency data 4. Western Washington.**—*M.R.*

GLACIOLOGY

See also: **Mt. Rainier, Wash. & its glaciers** (Bender et al.), 7.4–3; **Glacier advances** (Bengstow, Harrison), 7.4–257.

7.4–67 551.311.12:551.573(6

Bergström, Erik, **British Ruwenzori expedition, 1952. Glaciological observations Preliminary report.** *Journal of Glaciology,* 2(17):469 476, April **1955.** 14 figs., 10 refs English and German summaries p. 469. **DWB**—Pleistocene glaciation is summarized—onl one glaciation due to continued uplift. An account is given of present glaciation and post glacial fluctuations. Recession was greatest before 1900 and some glaciers have advance

ecently. The budget of the Elena Glacier is discussed; ablation above 4650 m during two periods of the year is the main source of loss, run-off being insignificant. Meteorological observations during 6 weeks in 1952 are summarized. *Subject Headings:* **1. Glacial ablation 2. Ruwenzori, Africa.**—*C.E.P.B.*

7.4–68 551.311.12:551.583.2

Heusser, Calvin J.; Schuster, Robert L. and Gilkey, Arthur K., **Geobotanical studies on the Taku Glacier anomaly.** *Geographical Review*, 64(2):224–236, April **1954.** 4 figs., table, 4 refs. Also: Field, William O., **Note on the advance of Taku Glacier.** *Ibid.*, p. 236–239. **DWB**—While most of the other valley glaciers have been retreating since 1900, Taku Glacier, near Juneau, Alaska, has been advancing. The reason given for this anomaly is that Taku Glacier rises at a higher elevation than most glaciers in this area, its source being at about 5000 ft elevation. The valley is also very narrow so there is little ablation. Measurements of trees and vegetation along the tree line indicate that the glacier will continue to advance until the present ice-wave has passed the terminus. The advance has been uneven, but averages 350 ft a year, a total of 18,200 ft since 1900. A report of 1953 surveys leaves the question of continued or even current advance unresolved, since the glacier movement has been so irregular on different fronts. No definite subsidence of ice is noted up toward the head of the glacier. *Subject Headings:* **1. Glacier movement 2. Taku Glacier, Alaska.**—*M.R.*

7.4-69 551.311.12:551.573(491)

Ives, J. D. and King, Cuchlaine A. M., **Glaciological observations on Morsárjökull S.W. Vatnajökull. Pt. 1, The ogive banding.** *Journal of Glaciology*, 2(16):423–428, Oct. **1954.** 3 figs., 11 refs. English and German summaries p. 423. **Pt. 2, Regime of the glacier, present and past.** *Ibid.*, 2(17):477–482, April **1955.** 4 figs., 10 refs. English and German summaries p. 477. **DWB**—In Pt. 1 the cause of alternating light and dark bands is discussed. Their distance apart agrees with annual movement of the glacier and they are attributed to some form of annual variation. In Pt. 2 estimates are given of firn accumulation made from profile in a 5 m pit at 1200 m on a small outlet glacier of Vatnajökull showing 2.38 m in 1951–52 and 0.82 m in 1952-53 (the summer of 1953 was the hottest on record). Average daily ablation in warm summer of 1953 was over 40 mm. Various other measurements are reported. The glacier is rapidly decaying; retreat since 1904 was 1000 m and thinning 90 m. A bulge in the median moraine is attributed to a rapid recession due to a warm period about 1890-1900. *Subject Headings:* **1. Glaciers 2. Glacial ablation 3. Vatnajökull, Iceland.**—*C.E.P.B.*

7.4–70 551.311.12(797)

Long, William A., **What's happening to our glaciers!** *Scientific Monthly*, Wash., D. C., 81(2):57–64, Aug. **1955.** 8 figs., 14 refs. **DWB, DLC**—A study of the shrinking glaciers in the northern Cascade Mountains of Washington State indicates that there was a "little ice age" in the middle of the 18th and 19th centuries which was comparable to that 10,000 years ago in effect, though not comparable in duration or extent. Trees on moraines of Mount Baker indicate that a limit of about 400 years can be placed on the more severe part of this "little ice age." Shrinkage of glaciers during past 50 yrs apparently ended between 1944 and 1950 when cooler weather brought a temporary advance in the rapidly retreating glaciers. A great deal of data are included in text. *Subject Headings:* **1. Glacial ablation 2. Cascade Mountains, Wash.**—*M.R.*

7.4–71 551.311.12(71)

†Meier, Mark F.; Rigsby, George P. and Sharp, Robert P., **Preliminary data from Saskatchewan Glacier, Alberta, Canada.** *Arctic*, Ottawa, 7(1):3–26, June **1954.** 13 figs., refs. **DWB**—Report on research, still in progress, concerning movements, structure, crystalline composition and other physical and chemical characteristics of Saskatchewan Glacier. The investigation includes continuous recording of pressure and temperature on the glacier's surface, supplemented by cloud cover, wind and precipitation observations. Heavy precipitation is suggested as a cause of an observed unusual phenomenon, namely a gradual acceleration of glacier movement followed by a sudden and larger deceleration. *Subject Headings:* **1. Glacier studies 2. Glacier movement 3. Saskatchewan Glacier, Alberta.** *G.T.*

7.4–72 551.311.17(268

Sandford, K. S., **Tabular icebergs between Spitsbergen and Franz Josef Land.** *Geographical Journal*, 121(2):164–170, June **1955.** map, 3 photos, 20 refs. **DWB**—Photograph of large tabular icebergs seen in 1923 and 1924 are described. Smaller tabular bergs were seen off North East Land in 1924 and 1925. They were not seen by later expeditions and only in the 1870's by earlier ones. The 1870 occurrences are attributed to glacier activity in Franz Josef Land pushing large unbroken ice masses into deep water. The occurrences of 1923–25 were believed to originate on lands to the east of North East Land, possibly remote carried by the Nansen or Polar Current. *Subject Headings:* **1. Icebergs 2. Arctic Ocean** —*C.E.P.B.*

7.4–73 551.311.1

Swithinbank, Charles, **Ice shelves.** *Geographical Journal*, 121(1):64–76, March **1955** 7 figs., 4 plates, 29 refs. **DWB**—The paper outlines the characteristics of the ice shelf c western Queen-Maud Land. Movement relative to Maudheim is plotted. The ice-shee increased in area by 0.097% in 6 mo. Accumulation was equivalent to 9 cm water in 6 mo this was disposed of by spreading and by melting 7 cm of ice from the lower surface. The she is in equilibrium. *Subject Headings:* **1. Barrier ice 2. Queen-Maud Land, Antarctic.**— *C.E.P.B.*

7.4–74 551.311.1

Tumashev, E. V., **Otstupanie kontsa lednika Devlokhan za 35 let.** [The retreat of th end of Devlokhan Glacier during a period of 35 years.] *Vsesoiuznoe Geograficheskoe Obsh chestvo, Izvestiia*, 86(1):93–95, Jan./Feb. **1954.** 3 figs., 11 refs. **DLC**—The Devlokha Glacier is one of the large glaciers of the southern slopes of the Peter the First mountain rang in northwestern Pamir. The observations on the retreat of the glacier made during variou intervals between 1913 and 1948 are compared and analyzed. *Subject Headings:* **1. Glacie retreat 2. Devlokhan Glacier 3. Peter the First Mts., Pamir.**—*I.L.D.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Hurricane hunters** (Tannehill), 7.4–5; **Climatological maps & diagrams** (Monkhouse, Wilkinson), 7.4–9; **Met. obs. manual** (Argentina. Serv. Met. Nac.), 7.4–19; **WMO. Comm. for Aerology** (Ashford), 7.4–22; **Arctic weather stations,** 7.4–24; **Antarctic obs. stations,** 7.4–26; **Winter base for Antarctica** (Sullivan), 7.4–27; **Lomnicky Štit Obs.,** 7.4–28; **Atmos. turbulence investigations** (Rösch), 7.4–29; **Zugspitze Obs.** (Germany. Deut. Wetterdienst), 7.4–20; **Geophysical observatories,** 7.4–31; **Typhoon reconnaissance** (U. S. Navy), 7.4–160; **UV radiation study** (Byran et al.), 7.4–178; **Ionospheric wind determination** (Court), 7.4–216; **Aurora observation** (Paton), 7.4–299.

7.4–75 551.501:551.508.41(0

Teddington, England. National Physical Laboratory, **Measurement of pressure wit the mecury barometer.** Its *Notes on Applied Science*, No. 9, **1955.** 15 p. 5 figs. (inc photos). **DWB**—A treatise on pressure measuring in general and on units, types of barometer choice of a barometer for particular purposes, transport and storage, installation, observation procedures, corrections, and testing methods used at the National Physical Laboratory (Teddington). The purpose of the bulletin is to help those who wish to use barometers or manom eters for industrial purposes. *Subject Headings:* **1. Barometers 2. Barometer manua 3. Pressure measurement.**—*M.R.*

7.4–76 551.501.1:551.515.4:551.577.3

Muchnik, V. M., **Nekotorye voprosy metodiki nabliudeniĭ livneĭ i groz.** [Problems observational methods of showers and thunderstorms.] *Meteorologiia i Gidrologiia*, Leningra No. 1:46–48, Jan./Feb. **1955.** fig., ref. **DWB**—The author points out the inadequacy

the observations on thunderstorms and intensity of showers in the Ukraine for determining their duration. Suggestions for obtaining more adequate data for determining the duration of these phenomena are presented. *Subject Headings:* **1. Thunderstorm observation 2. Rainstorm duration 3. Ukraine.**—*I.L.D.*

7.4–77 551.501.4:551.577.36

*Schneider-Carius, K., **Zur Frage der statistischen Behandlung von Niederschlagsbeobachtungen (3 Mitt.).** [On the statistical treatment of rainfall observations, Pt. 3.] *Zeitschrift für Meteorologie*, 9(9):266–271, Sept. **1955.** 7 tables. **DLC**—Rainfalls at Berlin for each month 1851–1950 are tabulated. These and monthly rainfalls for Hohenaschau (1891–1950) are classified by 10 mm intervals and also on a logarithmic scale and discussed. *Subject Headings:* **1. Rainfall statistics 2. Statistical analysis.**—*C.E.P.B.*

7.4–78 551.501.4:551.521.1

*Stolley, Gerhard, **Das natürliche Strahlungsklima, seine funktionelle Anhängigkeit von meteorologischen Faktoren und die Möglichkeit seiner einfachen Erfassung für gärtnerische und landwirtschaftliche Zwecke.** [The natural radiation climate, its functional dependence on meteorological factors and the possibility of its simple comprehension for horticultural and agricultural purposes.] *Meteorologische Rundschau*, 8(9/10):137–145, Sept./Oct. **1955.** 4 figs., 15 tables, 12 refs., eqs. **DWB**—Monthly means, maxima and minima of global radiation in Hannover and Brunswick, June 1949–May 1954, are tabulated. The daily radiation with different % amounts of sunshine is expressed as % of maximum radiation with clear sky, giving: % possible sun, 0, 22%; 11.3, 42.5%; 45.9, 68.2%; 79.4, 87.9%; little variation with season. These are higher than those given by ÅNGSTRÖM's formula, and a new formula is developed containing a constant which varies with place and month. At Brunswick this gives the monthly radiation with an error of 3–6%. Direct and sky radiation are calculated separately for each month for several stations in Germany; at Brunswick sky radiation varies from 81% of total in Dec. to 31% in May and June. *Subject Headings:* **1. Radiation calculations 2. Global radiation 3. Sunshine 4. Germany.**—*C.E.P.B.*

7.4–79 551.501.42:551.521.13

Schüepp, W. (*Met. Service, Belgian Congo*), **Bemerkungen zu J. Georgi's meteorologischer Solarkonstanten.** [Comments on J. Georgi's meteorological solar constant.] *Geofisica Pura e Applicata*, Milan, 30(1):179–181, Jan./April **1955.** table, 5 refs. English summary p. 179. Also: Georgi, J., **Entgegnung zu den vorstehenden Bemerkungen.** [Reply to the preceding comments.] *Ibid.*, p. 182–184. 6 refs. English summary p. 182. **MH-BH**—In the first article it is shown that LINKE's definition of the "subzonal" solar constant best meets the problems of the meteorologist. GEORGI's "meteorological" solar constant neglects wave regions very important in biology and in atmospheric heating and has to be rejected. The "astrophysical" solar constant needs further knowledge of X-rays, radio and corpuscular radiation in units of energy. The second article deals with 1) the problem of UV- and UR-corrections in the solar constant of the Astrophysical Observatory of the Smithsonian Inst. which seems to be insoluble without close contact with the *APO* itself. Therefore the writer suggests the renewal of the specialized "sub-committee for absolute pyrheliometry" in the former IMO as a discussion-group of all specialists concerned in this matter, especially of the APO. 2) In the writer's publications the Bouguer-Lambert law had been used chiefly as *formal* principle of extrapolation up to air mass 0, as stated before by W. WUNDT and others. Really one has to adopt also other forms of extrapolation according to the character of the radiation series. *Subject Heading:* **1. Solar constant corrections.**—*Authors' abstracts.*

7.4–80 551.501.45:519.241.8

†Essenwanger, O., **Zur Häufigkeitsanalyse meteorologischer Beobachtungen.** [On the frequency analysis of meteorological observations.] *Zeitschrift für Meteorologie*, 9(9):257–266, Sept. **1955.** 7 figs., 21 refs. **DLC**—Most meteorological series are not normally distributed and the arithmetic mean is not representative. Examples of frequencies best represented on a logarithmic scale are annual rainfall at Madras, and daily rainfall (June–Sept.) in Switzerland. Curves on a logarithmic scale of daily rainfall at St. Gotthard, and on a linear scale of daily

mean temperature at Karlsruhe, daily pressure at Stykkisholm, Ponta Delgada and Frankfurt, and quotient zonal/meridional geostrophic wind in N. Atlantic, are resolved into 3–5 normal distributions. These analyses often throw light on meteorological connections. *Subject Headings:* **1. Frequency distributions 2. Statistical analysis.**—*C.E.P.B.*

7.4–81 551.501.7:551.557:551.513

Martin, Donald E. and Anderson, William C. (*Air Weather Serv., 1st Weather Wing, Tokyo, Japan*), **West-wind component chart.** *American Meteorological Society, Bulletin*, 36(4):177–178, April **1955.** fig. **DWB**—The need for a more specific treatment of wind data than that based upon a mean zonal wind for a fixed longitudinal distance (180° or 120°) in a given latitudinal band for localized forecasting in the Far East is pointed out since "the latitude belt of maximum westerlies in respect to the Himalayas is a major factor in determining the type of weather regime throughout eastern Asia." The authors describe a graphical device developed in the Tokyo Weather Central and known as the "off-set-meter" for presenting the geostrophic westerly component for all points of the map. A diagram of the device is shown and its construction and use are described. *Subject Headings:* **1. Geostrophic wind scales 2. Zonal component of motion.**—*I.L.D.*

7.4–82 551.501.7:551.557:551.509.52

Rutherford, G. T. (*Central Met. Bureau, Melbourne*), **Comparison of forecast winds with those reported by aircraft on high altitude flights.** *Australian Meteorological Magazine*, Melbourne, No. 8:33–36, March **1955.** table, 3 refs. **DWB**—After assessing the errors involved in deriving upper winds from a 200 mb contour and isotach chart, and considering also the likely errors in "inflight" winds as computed by an aircraft navigator, it is concluded that computed and actual winds show reasonable agreement. Forecast winds are then compared with those computed and it is found that in 22 of the 25 zones considered, the forecasts are underestimates, the root mean square difference ranging from 11.5 to 13.5 kn. Some of the reasons for this difference and the weakness of the forecasting technique adopted are then discussed. *Subject Headings:* **1. Upper air wind computation 2. Wind forecasts 3. Forecasting techniques 4. Forecast errors.**—*Author's abstract.*

7.4–83 551.501.7:551.557:551.542.1

Silvester, R., **Method of obtaining the gradient wind from the geostrophic wind.** *Meteorological Magazine*, London, 84(1001):348–350, Nov. **1955.** 2 figs., 2 refs., 4 eqs. **DWB**—Relation is expressed as $\sin \phi = 1.91 \frac{U_{gr}}{r}\left(\frac{R^2}{1-R}\right)$, cyclones or . . . $\left(\frac{R^2}{R-1}\right)$, anticyclones, where ϕ = lat., r radius of curvature, and $R = U_{gr}/U_{gs}$ (geostrophic/gradient wind). A graph of U_{gr} as % of U_{gs} is plotted. *Subject Heading:* **1. Gradient wind computations.**—*C.E.P.B.*

7.4–84 551.501.81:551.507.352

Airborne weather surveillance radar. *Electrical Journal*, London, 195(7):456–458, Aug. 12, **1955.** 5 photos. **DLC**—Both R.C.A. and Bendix have developed radar which can be installed in commercial or military planes for avoidance of storm cells or hail in flight. The Super-constellation is the only type of plane that lends itself readily to this type of equipment since it has the extended nose. Details of the 5.6 cm R.C.A. equipment which is recommended for pure weather radar purposes since it has greater penetrability and contrast between heavy and light precipitation areas, and the 3.2 cm (X-band) Bendix radar which is used by military aircraft because it serves the dual purpose of weather and terrain mapping, are given and illustrated. Iso-echo contour presentation, to enable storm cells to be easily located and corridors successfully navigated with a minimum of loss of flight time, is discussed and illustrated. *Subject Headings:* **1. Air-borne weather radar 2. Thunderstorm avoidance 3. Radar equipment.**—*M.R.*

7.4–85 551.501.81:551.515

American Meteorological Society. Committee on Radar Meteorology, **Radar operation and data collection desired during tornadoes and other severe weather conditions. Report of the Committee, Alan C. Bemis, chairman.** *American Meteorological Society, Bulletin*,

36(6):289–291, June 1955. **DWB**—The procedures recommended involve radar operation when tornado warnings are issued or the weather maps indicate conditions favorable for severe squall lines, frontal or air mass thunderstorms, radar scope interpretation and reporting and verification. *Subject Headings:* **1. Radar storm detection 2. Radar tornado detection.** —*I.L.D.*

7.4–86 551.501.9:551.521

†*Albrecht, Fritz, H. W., **Establishment of a radiation network connected to ordinary weather stations and evaluation of their observations.** *Geofisica Pura e Applicata*, Milan, 29:115–154, Sept./Dec. 1954. 15 figs., 7 tables, 37 refs., eqs. English and German summaries p. 115–117. **DWB**—The author incorporated into this paper much of his practical experience acquired while in charge of a radiation network. The basic purpose of the study is to suggest ways and means for establishing radiation networks which can be operated in conjunction with regular meteorological stations. The instruments and methods proposed for such networks are the Robitzsch actinograph, photographic recording of global radiation, the triple-actinometer, the pulse actinometer, differential actinometers and the station pyrgeometer. All instruments are described in detail and illustrated. Operational and calibration details are discussed. Particular attention is given to problems connected with the evaluation of readings, and especially their applications to determination of various atmospheric values (turbidity, water vapor content, etc.). *Subject Headings:* **1. Radiation networks 2. Radiation instruments.**—*G.T.*

7.4–87 551.501.9:551.577.1

Watkins, L. H., **Variation between measurements of rainfall made with a grid of gauges.** *Meteorological Magazine*, London, 84(1001):350–354, Nov. 1955. fig., 4 tables. **DWB**—Nine standard gages were exposed in a square pattern 30 ft apart and read daily for 20 mo. Monthly variation from mean ranged from 4.5% with total 0.33″ to 0.8% with total 3.79″. Variation is attributed to local eddies. In 5 storms there was a maximum variation of 8% from mean. *Subject Headings:* **1. Rain gage networks 2. Rainfall measurement accuracy.**—*C.E.P.B.*

7.4–88 551.501.9:551.578.4

Wilson, Walter T. (*U. S. W. B.*), **Analysis of winter precipitation observations in the Cooperative Snow Investigations.** *Monthly Weather Review*, 82(7):183–199, July 1954. 11 figs., 2 tables, 2 maps. **DWB**—In the Cooperative Snow Investigations of the Corps of Engineers and Weather Bureau, observations were made of precipitation measurements in different kinds of gages and of water equivalent of snow on the ground at a great variety of station sites in the mountains of California and Montana for the five winter seasons ending 1950–51. Much of the variations in catch of precipitation over rugged areas of 4 to 20 sq mi is ascribed to variations in local exposure and in natural sheltering of the gages. Wind speed appears to be a good measure of the adequacy of gage shelter and of precipitation catch. The error in sampling of water equivalent for average snow sources is of about the same order of magnitude as the maximum daily change in water equivalent. For seasons of several months' length, observations of gage catch and of accumulated snow on the ground, each at good sites, appear to have comparable precision though there are inherent limitations in the validity of such comparisons. *Subject Headings:* **1. Snow measurement 2. Precipitation measurement 3. Rain gage exposures 4. California 5. Montana.**—*Author's abstract.*

OBSERVATIONAL DATA

See also: **Glacial-meteorological observations** (Orvig), 7.4–72; **Temp. data** (Fantoli), 7.4–180.

7.4–89 551.506:551.521.12:551.521.16

*Ashbel, Dov. (*Dept. of Met., Hebrew Univ.*), **Global solar radiation (gram calories/CM²) and daylight (in kilolux hours) in Jerusalem, Feb. 1955.** Jerusalem, Hebrew University, 1955. 37 p. entirely tables. **DWB**—Extensive tables give mean hourly global solar radiation

(from sun and sky on horizontal surface) for each month from July 1952 to Dec. 1954, and hourly values on each day of record from July 29, 1952 to Jan. 1955, inclusive (quite complete since April 1953); hourly global amount of daylight (in kilolux hours) on horizontal surface monthly mean global normal incidence daylight (sun and sky); Lucimeter-Davos global radiation on spherical surface, mean global radiation on sphere, forenoon radiation, time (in min.) to get an Erythema-Dosis by natural UV in Jerusalem at each hour of each month. Solar radiation measurements have been made at Hebrew University since Oct. 1930. Eppley pyrheliometer was installed in July 1952. *Subject Headings:* **1. Global radiation data 2. Daylight data 3. Jerusalem, Israel.**—*M.R.*

7.4–90 551.506.1(43)

*Germany. Deutscher Wetterdienst, **Deutsches Meteorologisches Jahrbuch, 1944, Teil 1. Tägliche Beobachtungen.** (German Meteorological Yearbook, 1944, Pt. 1, Daily observations.) Bad Kissingen, G. Braun GmbH., **1955.** 156 p. almost entirely tables. **DWB**—This is the last of the 1934–1944 series of yearbooks to be published for all of Germany. It comprises daily (and 7h, 14h and 21h) values of all standard elements recorded at 1st order stations (24 stations), and daily total hours of sunshine for 36 stations. The present yearbook does not contain as much data as pre-war or post-war volumes, since some of the basic data were lost, unavailable or too expensive to tabulate and publish. From 1945 on the data are published in separate volumes for each of the occupation zones. *Subject Headings:* **1. Annual meteorological reports 2. Observational data 3. Germany.**—*M.R.*

7.4–91 551.506.1(058, 43)

*Germany. Deutscher Wetterdienst, **Deutsches Meteorologisches Jahrbuch, Bundesrepublik 1953.** Bad Kissingen, **1955.** 214 p. almost entirely tables. 5 maps (fold.) **DWB**—This is the first of the yearbooks for the entire West Zone, and the first publication of any climatic data on a systematic basis in the French Occupation Zone, since the war. It contains daily values of all standard elements for 10 stations, monthly and annual averages or frequencies of data obtained at 125 2nd order synoptic stations, average and total monthly sunshine duration at 64 stations, hourly sunshine duration at 20 stations, average and soil temperature at 0.1, 0.2, 0.5 and 1.0 m depths thrice-daily, and max and min for 32 stations, daily precipitation for 56 stations, monthly and annual and greatest daily precipitation for >3000 rainfall stations, phenological data for >200 stations, and daily snow depth and water content of snow measured at 7 a.m. for a score of stations. A summary of aerological ascents at 8 places contains no actual data but merely a description of what data were obtained on upper air winds and temperatures, by various methods and at different hours. *Subject Headings:* **1. Annual meteorological reports 2. Meteorology yearbooks 3. Soil temperature data 4. Observational data 5. Germany.**—*M.R.*

7.4–92 551.506.1(569.5)

Jordan (Hashemite Kingdom). [Meteorological Service], **Meteorological observations at Amman, Trans-Jordan. Excerpted from Annual Report of Colonial Government.** Observations first published 1935 (then included with Meteorological Observations from Cyprus; *see* 2E–214, May 1951, *MAB*). **MH-BH,** 1937–1947, 1948; **DWB,** 1935–1947.—Data for Amman (1947 issue) (31°57′N, 35°57′E, 2548 ft elev.) include monthly and annual mean (for 0, 6, 12 and 18h) pressure, temp., V.P., R.H., cloud amount, rainfall, weather and wind direction. *Subject Headings:* **1. Meteorological observations 2. Amman, Transjordan.**—*M.R.*

7.4–93 551.506.1:63(05)

U. S. Weather Bureau, **National Weather and Crop Bulletin,** (June 1884)–Dec. 1921// **DWB**—This is a title whose history falls into two periods. (1) June 1884–June 1914, it has these variations in title: 1884–1887, **Special Bulletin of the U. S. Signal Office** (which published this and the succeeding title through 1891); June 1887–Feb. 1896, **Weather-Crop Bulletin;** March 1896–Aug. 1904, **Climate and Crop Bulletin;** 1906–June 1914, **National Weather Bulletin.** (2) July 1914–Dec. 1921, during which period it appeared as the **National Weather and Crop Bulletin.** In the two year interval, 1922–1923, the Dept. of Agriculture published its **Weather, Crops and Markets,** which incorporated similar information. This title was continued by the U. S. Weather Bureau, **Weekly Weather and Crop Bulletin, 1924 series.**

No. 1–. This last crop bulletin (*see* 5.4-37, April 1954, *MAB*) has recently (Oct. 18, 1954) been revamped, improved and enlarged under the direction of Dr. H. LANDSBERG, and includes short articles on important events (such as Hurricane "Hazel" in the Oct. 18, 1954 issue) affecting agriculture and an abbreviated summary of weather and crop conditions by states (temp. precipitation, top soil moisture, corn, wheat, cotton, pastures, vegetables and fruits). *Subject Headings:* **1. Weather and crop bulletins 2. United States. I. U. S. Signal Office II. U. S. Dept. of Agriculture.**—*M.R.*

7.4–94 551.506.3:551.524(45)

*Barbanti-Silva, Luigi and Depietri, C., **La temperatura media diurna a Modena. Valori normali ed analisi statistica.** [Daily mean temperature at Modena. Normal values and statistical analysis.] *Modena. Università. Osservatorio Geofisico, Pubblicazioni*, No. 58, **1954.** 18 p. 12 tables, graph (fold.). **DWB.** Reprint from *Accademia di Scienze, Lettere e Arti di Modena, Atti e Memorie*, Ser. 5, v. 12, **1954**—Mean daily, decadal and monthly temperatures are calculated for period 1929–48, and frequency distributions of mean daily temperature shown for each month in tabular and graphic form. Other statistical analyses of decadal and monthly mean temperatures are shown in tables and discussed. Normal daily and decadal monthly temperature for 50 yr period (1899–1948) at Modena also presented in table. Difference between 50 year values 1899–1948 and those calculated by BARUZZI for 1881–1925 (45 year) also shown in table. *Subject Headings:* **1. Temperature data 2. Long period records 3. Modena, Italy.**—*M.R.*

7.4–95 551.506.3(495)

*Greece. Ethnikon Asteroskopeion Athēnōn. Meteorological Institute, **Supplement of the Réseau Mondial giving climatological data of the years 1933–1950 for Athens, Greece (National Observatory).** Athens, **1955.** 12 p. entirely tables. **DWB**—A table, in the form prescribed by the IMO for Réseau Mondial, is given for each separate year from 1933–1950, inclusive, for the National Observatory of Athens (37°58′N, 23°43′E, 107 m elev.). Normals used for calculating departures from normal are for 1901–1940 for temperature and 1861–1940 for precipitation. No changes were made in exposure of instruments during the period 1933–50. *Subject Headings:* **1. Climatic data 2. Réseau Mondial 3. Athens, Greece.**—*M.R.*

7.4–96 551.506.3(68) 551.582.2(68)

*South Africa. Weather Bureau, **Klimaat van Suid-Afrika, Deel 1, Klimaat-statistieke.** [Climate of South Africa, Pt. 1, Climate statistics.] Its *W.B.* 19, **1954.** 158 p. title-page and text in Afrikaans and English. mostly tables. Price: £1. **DWB**—A revised edition of a work on **Climate of South Africa,** with emphasis on temperature (first published in 1940) is presented with discussion of climate eliminated and data tables brought up to 1950. General tables contain data for 140 stations on humidity, cloud amount, precipitation, number of days with various weather elements, as well as a dozen temperature elements, temperature tables for 320 stations, frost data for 270 stations, frequency of daily max and min temperatures in 5°F intervals for 32 stations, average interdiurnal temperature variability (60 stations), sea level temperatures for each 2° intersection of lat. and long., mean hourly temperature (31 stations), mean hourly relative humidity (26 stations) and mean earth temperatures (19 stations). Rainfall data and discussion of climate are reserved for later volumes. *Subject Headings:* **1. Climatic data 2. South Africa.**—*M.R.*

7.4–97 551.506.3:551.577(68,688)

*South Africa. Weather Bureau, **Klimaat van Suid-Afrika, deel 2, Reenvalstatistieke.** [Climate of South Africa, Pt. 2, Rainfall statistics.] Its *W.B.*, 20, **1955?** 187 p. mostly tables. Price: £1. **DWB**—Extensive tables of rainfall statistics for South Africa are grouped into 4 sections: Sec. I gives 30 year normals (1921–50) for 513 stations carefully selected to give an even distribution, and 128 more for 25–30 years to fill in gaps. Coordinates, quarterly and seasonal (dry and wet season) averages and percentages of total annual amounts, monthly and annual averages are presented in this section. Sec. II gives average, max and min annual and dates, 5-year averages for entire period of record for about 5250 stations in South and Southwest Africa, arranged by ½° squares of lat. and long. Sec. III gives average frequencies of specified rainfall amounts for 15 min periods, and max falls in 15, 30, 45, 60 min and 24 hr

intervals from autographic gages at 20 1st order stations. Sec. IV gives for each month average, diurnal (hourly) variation in amount and frequency of rainfall for 10 1st order stations. *Subject Headings:* **1. Rainfall statistics 2. Rainfall data 3. South Africa 4. Southwest Africa.**—*M.R.*

7.4–98 551.506.7(51)

*Hong Kong. Royal Observatory, **Meteorological Results, 1952, Pt. 2, Upper air observations.** pub. **1954.** 80 p. almost entirely tables. Price: $6. G. S. P. Heywood, Director Royal Observatory. **DWB**—Four times daily (05, 11, 17 and 23h) pilot balloon, and 07 or 08h radiosonde data are tabulated for each day and month. Besides the usual surface 1000, 900, 850, 800, 700, 600, 500, 400, 300, 200, 150, 100, 60 and 40 mb height, temperature and wind data, the highest freezing level (pressure and geopotential), the tropopause (type, pressure, geopotential, and temperature), the shear vector change, discontinuity of temperature (type, pressure, relative humidity at base and top), the max wind (pressure, geopotential, direction and velocity) are tabulated. Kew Mark II Radiosondes were used at Kings Park Radiosonde Station. For previous issues (without radiosonde data) *see* 4E–69 and 5B–2, May, 1953 and Feb. 1954, respectively *MAB*. *Subject Headings:* **1. Upper air data 2. Upper air wind data 3. Tropopause data 4. Inversion data 5. Annual aerological summaries 6. Hong Kong.**—*M.R.*

7.4–99 551.506.8:551.588.2

Heigel, K., **Exposition und Höhenlage in ihrer Wirkung auf die Pflanzenentwicklung.** [Aspect and height in their effect on plant development.] *Meteorologische Rundschau*, 8(9/10):146–148, Sept./Oct. **1955.** 4 figs., 4 refs. **DWB**—The dates of beginning of winter rye harvest, flowering of cherry and blooming of dandelion around Hohenpeissenberg are plotted against height for different aspects. For rye (540–900 m) the retardation was 7 days/100 m and between most and least favorable sites 7–10 days; for cherry (550–855 m) 2 days/100 m and 5–7 days. For dandelion (820–980 m) the retardation was irregular and much greater. *Subject Headings:* **1. Phenological data 2. Topographic influences 3. Hohenpeissenberg, Germany.**—*C.E.P.B.*

INSTRUMENT CARRIERS

See also: **Airborne weather radar,** 7.4–84; **UV radiation study** (Byram et al.), 7.4–178.

7.4–100 551.507.362

Haas, Winfried, **Aus der Raketenentwicklung.** [Rocket development.] *Umschau*, 56(1):13–14, Jan. 1, **1956.** 6 figs. **DLC**—Descriptions of the means of stabilizing rockets in flight, with photos of "Veronique" and "Oerlikon" in flight and launching platform for the latter. *Subject Heading:* **1. Rockets.**—*C.E.P.B.*

7.4–101 551.507.362:523.4

Spitzer, Lyman, Jr. (*Dir., Princeton, New Jersey Observ.*), **Voyages interplanétaires.** [Interplanetary voyages.] *Ciel et Terre*, Uccle, 71(3/4):57–64, March/April **1955. DLC**—General aspects of exploring the planets or moon by rockets are discussed. Difficulties due to unique environmental changes are emphasized, and the problem of returning to the earth considered. *Subject Headings:* **1. Interplanetary rocket flights 2. Rocket flights.**—*M.R.*

7.4–102 551.507.362

Stroud, W. G.; Terhune, E. A.; Venner, J. H.; Walsh, J. R. and Weiland, S. (*all U. S. Signal Corps Engineering Labs., Ft. Monmouth, N. J.*), **Instrumentation of the rocket-grenade experiment for measuring atmospheric temperature and winds.** *Review of Scientific Instruments*, N. Y., 26(5):427–432, May **1955.** 9 figs., table, 11 refs. **DLC**—Results of 92 grenade explosions from 15 Aerobee rocket firings from March 3, 1950 to Sept. 4, 1953 at White Sands, N. M., are being analyzed with respect to efficiency of this method of determining upper air temperatures and winds. From 4 to 8 grenades are exploded on each flight at specified heights (which can be determined to ±1 to 6 ft at 100,000 ft by photographic methods). The formulas $C=kT^{\frac{1}{2}}$ and $V=C+W$ are used; where C is velocity of sound due to elasticity, k a constant, T = absolute temperature, V = velocity of propagation of sound wave,

and W = wind velocity. Methods, rockets, rocket instrumentation, grenade structure, flash detectors, telemetering system, safety features, sound ranging equipment, positions of grenade explosions, ground temperatures and a summary of the 15 firings are included in text, and equipment and some of the records are illustrated. The temperatures and wind can be determined for each successive layer (between grenade firings) timing to .1 millisecond is necessary. The sound detectors are arranged so they are nearly vertically beneath each grenade when it is exploded. *Subject Headings:* **1. Rocket-grenade wind determination 2. Rocket-grenade temperature determination 3. Acoustical soundings 4. Aerobee rocket firings 5. Rocket instrumentation 6. White Sands, N. Mex.**—*M.R.*

7.4–103 551.507.362:551.510.536

Tiny rocket to drop ball from 75 miles up. *Science News Letter*, Wash., D. C., 67(13):196, March 26, **1955. DLC**—A 220-pound rocket, 8 ft tall, has been designed to collect upper atmospheric data and transmit radio information to the ground during its fall from an altitude of 75 miles. Tests were prepared at the NACA's proving ground at Wallop's Island, Virginia. The midget rocket will be used over the Arctic in the International Geophysical Year 1957–58. The rocket is to be launched from an airplane. *Subject Headings:* **1. Rocket exploration of the upper atmosphere 2. Rocket soundings 3. International Geophysical Year, 1957–58.**—*W.N.*

INSTRUMENTS

See also: **Met. instruments** (Germany. Deut. Wetterdienst), 7.4-2; **Air-sea boundary process** (Munk), 7.4–46; **Aviation instruments** (Majendie), 7.4–53; **Pressure measurem.** (Teddington, Eng. Natl. Phys. Lab.), 7.4–75.

7.4–104 551.508.72

Vilkner, Hans, **Eine Verdunstungs-Fernregistriereinrichtung mit einer neuen Form eines Abtropfrohres.** [A distant recording evaporimeter with a new form of trickle tube.] *Zeitschrift für Meteorologie*, 9(9):271–277, Sept. **1955.** 5 figs., 3 tables, 4 refs. **DLC**—The instrument consists of an evaporating cistern connected by a buried rubber tube to a filling tube, then through a damper to a trickle siphon tube and finally to a chamber with a float which transmits movement to a pen arm with a magnification of 10. Three methods of obtaining the normal level are compared: "board with nail," overflow pipe and trickle tube; the last presents numerous advantages. An example of a record with its evaluation is given. *Subject Heading:* **1. Evaporation instruments.**—*C.E.P.B.*

7.4–105 551.508.765:551.574.7 551.311.1

*Aeronautical Ice Research Laboratory, Minneapolis, Minn., **Engineering Reports** (23 reports beginning IRB 46-27-3P, May 1946 through AIRL 6118 48-34-1, June **1938**). Holder of Contract varies. 1946—Northwest Airlines, Inc. 1947—Smith, Hinchman & Grylls, Inc. Name of Laboratory varies: formerly, Ice Research Base. **DWB**—This collection of reports on icing research and instrumentation contains over a score of separate reports on such subjects as: 1) Rotation icing rate meter; 2) Visibility indicator; 3) Thermal anti-icing survey on Mt. Washington Nov. 1945–Feb. 1946; 4) Performance of 2 electrically heated cylinders under icing conditions on Mt. Washington; 5) Static discharge currents during icing conditions; 6) Infra-red heating for ice prevention; 7) Service tests on heated pilot anemometers; 8) Analysis of weather conditions conducive to icing of aircraft in U.S.A.; 9) Dew point recorder; 10) Heat transfer coefficients from cylinders at high wind speeds under icing conditions. Reports contain data, charts, schematic diagrams and line drawings, and glossy prints of equipment. *Subject Headings:* **1. Icing of aircraft 2. Visibility meters 3. Icing instruments 4. Electricity of icing 5. Icing research. I. Northwest Airlines, Inc. Ice Research Base, Minneapolis, Minnesota II. Contract W535-ac-35714 III. Contract W33-038-QC-14845 IV. Contract W33-038-ac-18024 V. Smith, Hinchman & Grylls, Inc.**—*M.R.*

7.4–106 551.508.765:551.576.11

Massachusetts Institute of Technology. Dept. of Meteorology, **Measurement of drop size distribution and liquid water content in natural clouds.** Contract AF 19(122)-245, Final Report, Sept. 30, **1954.** 13 p. 12 refs. **DWB**—An infrared transmissometer has been devel-

oped which successfully measures the size distribution and total number of water droplets in natural cloud. The size range accommodated is 1 to 32 microns diameter. This instrument also functions as a liquid content meter. Incidental to the development of the transmissometer, machine computations of effective transmission cross-sections of water drops with complex index of refraction have been made. These are of significant value in investigations of the light scattering power of water aerosols. Improvements have been made to a glass slide cloud camera, but they have not been proven by field tests. An electronic probe type instrument for sizing and counting cloud drops has been developed and calibrated in the laboratory in the size range 4 to 50 microns. Of these three instruments, the electric probe can be most easily applied to airborne use. *Subject Headings:* **1. Transmissometers 2. Infrared cloud drop size meters. I. Contract AF 19(122)-245 II. Keily, D. P.**—*Author's abstract.*

7.4–107 551.508.79:551.579.5

Stanhill, G. and Winter, E. J., **An instrument for measuring soil-moisture deficit.** *Nature*, London, 176(4496):1276, Dec. 31, **1955.** 2 refs. **DWB**—Describes an instrument comprising a rain gage and an equal evaporating area (unglazed ceramic) which draws water by capillarity from the gage. It is suitable for day-to-day control of irrigation. *Subject Heading:* **1. Soil moisture instruments.**—*C.E.P.B.*

7.4–108 551.508.822

Abild, Bruno (*Aerologische Station Flensburg*), **Ein Vergleich der Radiosondenaufstiege im Deutschen Wetterdienst.** [Comparison of radiosonde ascents in the German Weather Service.] *Germany. Deutscher Wetterdienst. Instrumentenamt Nord, Hamburg, Technische Mitteilungen*, No. 23, April **1953.** 6 p. 4 figs., table, 5 refs. **DWB**—Tables and graphs show relative accuracy of different types of radiosondes used at 7 stations in West Germany (including Berlin) in 1952, based on 214 ascents for each station. Comparisons were made for per cent of flights reaching various heights (225 and 96 mb.). Correction factors and their value, the temperature error of the American radiosonde, the scattering of errors, and the necessity for improvement for synoptic purposes, in spite of the good apparent agreement between radiosondes, are discussed. *Subject Headings:* **1. Radiosonde comparisons 2. Graw radiosondes 3. German weather service.**—*M.R.*

7.4–109 551.508.822:06

Aleksandrov, L. A., **Dvadtsat' piat' let sovetskogo radiozondirovaniia.** [Twenty-five years of Soviet radiosounding.] *Meteorologiia i Gidrologiia*, No. 2:65, March/April, **1955. DLC**—A report on the conferences held in various parts of the U.S.S.R. in celebration of the twenty-fifth anniversary of the release of the first radiosonde in the world by P. A. Molchanov. Topics of discussions held at the meetings and names of important scientists attending are mentioned. *Subject Headings:* **1. Radiosondes 2. Conferences 3. U.S.S.R.**—*I.L.D.*

7.4–110 551.508.822

Misselwitz, W., **Beschreibung einer Vorrichtung zur Bestimmung des Trägheitsbeiwertes des Bimetalls der Lang- und Freiburg-Sonde.** [Description of an apparatus to determine the joint lag coefficient of the bi-metal of the Lang and Freiburg sondes.] *Zeitschrift für Meteorologie*, 9(9):277–280, Sept. **1955.** 4 figs., 2 refs. **MH-BH**—The apparatus consists of a tube divided into 2 equal arms of the same diameter as the radiation shield of the Freiburg sonde. The airstream of these is heated electrically to a known temperature, then converted to laminar flow by glass plates and passed on to the radiosonde. A diagram and examples of measurement are given. *Subject Heading:* **1. Radiosonde calibration.**—*C.E.P.B.*

7.4–111 551.508.85:621.396.826

Astill, Kenneth N.; Trueswell, Richard W.; Mitchell, Michael W. and Forbes, George R., **Aerodynamic and radar transmissivity properties of screen materials.** *U. S. Air Force Cambridge Research Center, AFCRC-TR-54-112*, Sept. **1954.** 62 p. 51 figs. (incl. photos.) 4 refs. **MH-BH**—The aerodynamic properties of seventeen types of screen materials that could be used for reflectors of radar antennas were determined in wind tunnel tests conducted at Massachusetts Institute of Technology. Methods, procedures, and results are discussed in Pt. I. The information presented includes curves plotted for: 1) C_D and C_L versus angle of

ittack; 2) drag/solidity versus angle of attack; and 3) solidity versus maximum resultant force, based on the correlation found between solidity and drag for similar screens. Maximum values of the aerodynamic coefficients of lift drag and resultant force and the angle at which they occurred are shown in tabular form. The radar transmissivity properties are discussed in Pt. II. *Subject Heading:* **1. Radar equipment.**—*Authors' abstract.*

7.4–112 551.508.91:551.574.1

Holl, W. and Mühleisen, R., **Ein Kondensationskernzähler mit kontinuierlicher Übersättigung.** [A condensation nuclei counter with continuous supersaturation.] *Meteorologische Rundschau*, 8(9 10):165 169, Sept./Oct. **1955.** 8 figs., 15 refs., 3 eqs. **DWB**—The principle is to add to a stream of air (5 cm³/sec) in the chamber a current of HCl gas (0.5 cm³/sec) under constant pressure, the mixture being continuously pumped out. The base of the chamber is covered by a stream of water at the temperature of the chamber. Recording is by an optical-electrical measurement of the cloud density. Full wiring diagrams, photographs and specimen records are given. *Subject Heading:* **1. Condensation nuclei recording instruments.**—*C.E.P.B.*

7.4–113 551.508.94:621.317

Bossolasco, Mario and Meda, Fernando, **Un nuovo tipo di elettrometro.** [New type of electrometer.] *Geofisica Pura e Applicata*, Milan, 30(1):151–154, Jan./April **1955.** 2 figs., 3 refs. Italian and English summaries p. 151. **DWB**—The authors describe a very simple valve-electrometer, operating with a dry-battery of 1.5 volts only. The valve is used with inverted electrodes, while different cathode-resistances assure the automatic polarization. In this manner all needed sensitivities occurring in atmospheric electricity can be obtained. *Subject Headings:* **1. Atmospheric electricity instruments 2. Electrometers.**—*Authors' abstract.*

7.4–114 551.508.94:551.594.12

Imbò, Giuseppe and Vittozzi, Pia, **Il potenziale di saturazione nelle camere di ionizzazione.** [Saturation potential of ionization chambers.] *Geofisica Pura e Applicata*, Milan, 30(1):113–129, Jan./April **1955.** 3 figs., 96 eqs. Italian and English summaries p. 113–114. **DWB**—Authors give two distinct methods for the determination of the saturation potential of an ionization chamber, consisting of a plane or a cylindrical condenser. The first method (Imbò) gives the following relation between the saturation potential and the saturation fraction (the same in both cases, plane and cylindrical): $V^2 = 5.91 \times 10^{-10} \frac{v^2}{C^2} \frac{g}{1-S}$; where C and v are respectively the electrical capacitance and the volume of the chamber, V the saturation potential, q the number of ion pairs generated per unit time in unit volume, and S is the saturation fraction. The second method (Vittozzi) allows, by means of graphic integrations, to draw by points the pattern of the saturation potential against the saturation fraction, for a specific ionization chamber and a given value of q. From that follows obviously the possibility of extending the two methods to any kind of ionization chamber, provided the law of variation of the field intensity within the chamber itself is known. *Subject Heading:* **1. Ionization chambers.**—*Authors' abstract.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Weather almanacs** (Sloane), 7.4–7; **Equatorial weather** (Watts), 7.4–10; **Synoptic code manual** (U.S.W.B.), 7.4–17; **Forest fire weather** (Cramer), 7.4–63; **Aids for forecasting high fire danger** (Lanning), 7.4–64; **Fire whirlwinds** (Graham), 7.4–65; **Lightning storms** (Hibbard), 7.4–66; **Forecasting techniques** (Rutherford), 7.4–82; **Storm warning procedures** (Philippines. Weather Bur.), 7.4–152; **Rainfall periodicities** (Brier), 7.4–234.

7.4–115 551.509.31:551.511

Pfeffer, Richard L. and Saltzman, Barry, **Large-scale rotational flow in a fixed cylindrical volume of the atmosphere.** (In: Massachusetts Institute of Technology. Dept. of Meteor-

ology, Contract AF 19(122)-153, **Studies of the Atmospheric General Circulation, Final Report** Pt. 1, May 31, **1954.** p. 267–284. 7 figs., 3 tables, 10 refs., 4 eqs.)—An exact equation by STARR for the change of angular momentum relative to an arbitrarily located, fixed vertical axis is expressed in approximate form, and a long-period observational study is made in two geographical regions of the atmosphere to determine the validity and prognostic implications of the resulting simplified relationship. It is found that the fluctuations of local angular momentum in these regions can be accounted for almost entirely by the horizontal eddy exchange of this momentum with the surrounding atmosphere. Moreover, a sufficient lag relationship is seen to exist so that the transport of local momentum can serve as a predictor of the 12 hour change in the intensity of rotational flow in the regions. *Subject Headings* **1. Forecasting techniques 2. Momentum transport.**—*Authors' abstract.*

7.4–116 551.509.312

Lund, Iver A. (*U. S. A. F. Cambridge Res. Center, Mass.*), **Estimating the probability of a future event from dichotomously classified predictors.** *American Meteorological Society Bulletin*, 36(7):325–328, Sept. **1955.** 2 tables, 4 refs., eqs. **DWB, DLC**—The familiar multiple-regression equations are adapted to the problem of determining the probability of a future event from dichotomously classified predictors. The probability of an event can be computed rapidly by this method and can be used as a first approximation of what the subsequent weather will be. An example is included to illustrate how the method is used and to show a comparison between the computed probability values and the observed values. *Subject Headings:* **1. Numerical forecasting 2. Multiple regression techniques 3. Dichotomously classified predictors.**—*Author's abstract.*

7.4–117 551.509.312

§Sanderson, Alan N. and Thomas, Charles F. (*both, WBAN Analysis Center, U. S. W. B., Wash., D. C.*), **Application of Fjørtoft vorticity technique.** Wash., D. C., U. S. Weather Bureau, Aug. 10, **1954.** 8 p. 10 figs., 3 refs. **DWB**—FJØRTOFT's (1952) graphical method for objective preparation of 500 mb progression charts has been modified to facilitate quick compilation at the WBAN analysis center. The method involves 4 stages of computation which are discussed step by step: computation of: 1) space-mean flow pattern, 2) of relative vorticity field, and 3) advection of relative vorticity field with the space-mean flow pattern. The fourth step, computation of the 500 mb height changes for the period, and addition to the original 500 mb chart to obtain the prognostic chart, is eliminated and instead 36-hour compilation of field by means of acetate overlays is employed. Techniques as applied to situations over North America on April 15-17, 1954, are described and illustrated. *Subject Headings:* **1. Fjørtoft's graphical method 2. Objective 500 mb progression chart preparation.**—*M.R.*

7.4–118 551.509.312

Shuman, Frederick G. (*U. S. W. B., Wash., D. C.*), **Method for solving the balance equation.** *U. S. Joint Numerical Weather Prediction Unit, Technical Memorandum*, No. 6, May 23, **1955.** 12 p. 2 refs., 32 eqs. **DWB**—This paper, according to the author, presents a solution of the balance equation in isobaric coordinates: $2\psi_{xy}{}^2 - 2\psi_{xx}\psi_{yy} - f(\psi_{xx}\psi_{yy}) - \phi_{xx} - \phi_{yy} = 0$, where ψ is the stream function; f, the coriolis parameter and ϕ, the geopotential. The above equation is treated as a boundary value problem (provided the equation is not fundamentally hyperbolic). The discussion is not concerned with proofs of convergence or relaxation methods applied to the equation, but with the method of handling problems which arise from the quadratic nature of the equation. *Subject Headings:* **1. Numerical forecasting 2. Balance equation.**—*M.R.*

7.4–119 551.509.312

Sutton, Oliver Graham (*Dir. Met. Office, London*), **Comparison of forecast charts made by ordinary methods and those made by high-speed computing.** Remarks presented before the National Science Foundation-Univ. of Calif. at Los Angeles Conference on the Significance and Possibilities of High-Speed Computing in Meteorology and Oceanography, May 13-15, in Los Angeles, Calif. [1955?] 7 p. 5 eqs. **DWB**—An evaluation of prognostic charts during 3 periods prepared by machine using a 2 parameter model, and by ordinary prebaratic

ethods (Jan. 27, 1952 to Jan. 30, 1953), shows that numerical methods give comparable esults (as good as, or better than subjective methods) for areas well away from the boundary f the grid, and for situations where the subjective methods were also satisfactory, but for ricky situations the numerical methods were as bad as, or worse than, the subjective. In the ase of the Jan. 30, 1953 storm that damaged the channel coasts, the numerical methods would ave exaggerated the intensity of the systems. *Subject Headings:* **1. Numerical forecasting valuation 2. Two-parameter models 3. Prebaratic charts.**—*M.R.*

7.4-120 551.509.33

Davy, John (*Scientific Correspondent, Sunday Observer*), **Weather outlook: uncertain. South Africa.** *Weather Bureau, News Letter*, No. 73:3–4, April 30, **1955. DWB**—Remarks n cold summers of 1954 and unusual hurricanes, floods, snow, etc., and possibility that con- itions will be repeated in the future. Also singularities and symmetry points, the 72 day and sub-multiple 36, 24, 18, 12, 8 and 6 day) period and other systems which might be valuable n long range forecasting are discussed. *Subject Headings:* **1. Weather anomalies 2. Singu- arities.**—*M.R.*

7.4–121 551.509.33:551.58

Lawrence, E. N., **Climatology and long-range forecasting.** *Weather*, 10(12):410–412, Dec. **1955.** 9 refs. **DWB**—Brief discussion of seasonal sequences, singularities and surface pressure anomalies. *Subject Headings:* **1. Long range forecasting 2. Climatological prediction.** —*C.E.P.B.*

7.4–122 551.509.54

Hoose, Harry M. (*Weather Bureau, San Juan, Puerto Rico*), **Search for an objective method of forecasting precipitation in Southeastern Alaska.** U. S. Weather Bureau, Feb. 5, **1955.** 9 p. tables. Mimeo. **DWB**—Several parameters were tested to find best objective method of forecasting precipitation in S.E. Alaska—especially at Juneau. The most promising variables for spring, summer and fall were found to be: 1) 850 mb flow [height of 850 mb surface at Annette, Alaska minus height at Yakutat (ANN-YAK)] indicating onshore flow; 2) potential temperature change in past 24 hours at tropopause indicating advection of cold tropical or warm arctic air; 3) advection at 700 mb; and 4) persistence (precipitation or no precipitation at time of forecast). Stability and 24-hour temperature change at 700 mb made little difference. Forecasts verified 85% correct (against 69% for official forecasts) or .81 kill score (against .39). *Subject Headings:* **1. Objective precipitation forecasts 2. Tropopause dvection 3. Juneau, Alaska.**—*M.R.*

7.4–123 551.509.58:632.187

*Ayer, H. S. (*U. S. W. B., Olympia, Wash.*), **Outline of** [his] **"Forecasting surface winds or the Fire-Weather District at Glenwood, Washington."** Wash., D. C., U. S. Weather Bureau, June **1953.** 3 p. fig. **DWB**—A brief summary of a study made for the 1949–1951 fire seasons for Glenwood Fire-Weather District (located in the center of a valley with gentle slopes at 1800 ft elevation and oriented S.W.-N.E.). Daily charts for wind direction surface, 4000 and 6000 ft at 13 h.), dew points and cloud amounts were drawn from July–Sept. 1951. An empirical table shows surface wind to be expected with gradient wind from the 8 directions and various lapse rates forecast (steep, moderate or weak). Wind force to be forecast is expressed in terms of percent of gradient wind speed. *Subject Headings:* **1. Fire- weather forecasting 2. Local wind surveys 3. Objective forecasting 4. Orographic effects 5. Glenwood, Washington.**—*M.R.*

7.4–124 551.509.6

Brundidge, Harry T., **The weather is changing.** *American Mercury*, N. Y., 90(374):17–19, March **1955. DWB**—A brief popular account of the effects of atom bombs and rain makers vs. natural climatic changes and possibility of control through regulation of solar energy by dust or CO_2 control, and of observation from an asteroid about 400 miles from earth. *Subject Headings:* **1. Weather control 2. Satellite observatories.**—*M.R.*

7.4–125 551.509.6:631.6

Timofeev, M. P., **Ob izmenenii meteorologicheskogo rezhima pri oroshenii.** [Th change of the meteorological regime during irrigation.] *Akademiia Nauk SSSR, Izvestiic Ser. Geofizicheskaia*, No. 2:108–113, **1954.** 4 figs., 3 refs., 23 eqs. **DLC**—A theoretica analysis of the changes in temperature and humidity resulting from the irrigation of limite areas, based upon the physical fact that irrigation alters the evaporation regime from th surface, and the radiational balance and heat exchange between the surface and atmosphere Formulas, based upon the equation of turbulent diffusion, are developed for expressing th variation of equivalent temperature, i.e., the combined variation of temperature and humidit during irrigation. The role of turbulent exchange and that of the surrounding non-irrigate plots as in determining the meteorological conditions over the irrigated plots are discussed *Subject Headings:* **1. Artificial climates 2. Irrigation effects.**—*I.L.D.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC POLLUTION

See also: **Atmos. pollution control,** 7.4–126; **Diffusion equations** (Rounds), 7.4–139; **Day time darkness** (Helliwell, Blackwell), 7.4–171; **Smoke dispersion** (Hawkins, Nonhebel), 7.4–200; **Humidity & corrosion** (Ambler), 7.4–220; **Cloud over sheep mountain** (Harbour), 7.4–292.

7.4–126 551.509.9:551.510.42:0

The Bournemouth conference: two delegates' impressions. *Smokeless Air*, Londor 96:82–86, Winter **1955.** 6 photos. **DWB**—Mainly an account of discussions of the Beave report and the Clean Air Bill. *Subject Headings:* **1. Atmospheric pollution conferences 2. At mospheric pollution control.**—*C.E.P.B.*

7.4–127 551.510.42:019.94

Air Pollution Control Association, Pittsburgh, **APCA Abstracts,** vol. 1, no. 1, June **1955** (?) Latest issue seen, 1(7), Dec. **1955.** Monthly. Editor, William L. Nelson. Loose-leaf **DLC**—Issue No. 5 contains 52 abstracts (on 7 pages), classified according to: 1) Genera aspects, 2) Emission and dispersion and atmospheric phenomena, 3) Control, 4) Sampling 5) Surveys, 6) Effects, 7) Legislation, 8) Management, 9) Books, and 10) Bibliographies. A are in English from American and English sources. Abstracts are usually informative References are all to literature appearing within past 6 months. *Subject Heading:* **1. At mosphere pollution abstracts.**—*M.R.*

7.4–128 551.510.42:551.594.1

Heslep, J. M. and Bellamy, A. W. (*Radiological Safety Serv., Calif. Off. of Civil Defence*) **Sampling for airborne radioactivity.** *Air Repair*, Pittsburgh, Pa., 5(1):1–4, May **1955** 6 refs. **DWB**—Nature and source of radioactive particles, biological effects, size of particle most effective in body (5μ), retention and exhalation, sources of contamination of air durin various phases of atomic industry, methods of sampling and analysis and problems connecte therewith, constructive use of radioactive aerosols (tagging air currents for meteorologica studies), networks of sampling stations and success in predicting concentrations at thes stations are discussed. *Subject Headings:* **1. Air-borne radioactivity sampling 2. Radioactiv aerosols.**—*M.R.*

7.4–129 551.510.42:523.

Thomsen, Warren J. (*Wisconsin St. Coll., Whitewater*), **The annual deposit of meteoriti dust.** *Sky and Telescope*, 12(6):147–148, April **1953.** 2 figs., 6 refs. **DLC**—Samples o meteoric dust (80% of it magnetic) gathered in Iowa from Nov. 1951 to April 1952 give a estimated figure of 6000 tons per day for the earth as a whole. The figure is 1000 times tha

timated by WYLIE (1935) or WATSON (1941) for meteors and meteorites, and does not include eteorites or non-spherical or non-magnetic particles. The figure does agree with VAN DE ULST's work on density of dust in interplanetary space obtained from studies of the zodiacal ght. Graph shows size distribution of magnetic spheres for 3 different periods during 1951 nd 1952. *Subject Headings:* **1. Meteoric dust fall 2. Iowa City, Iowa.**—*M.R.*

UPPER ATMOSPHERE—IONOSPHERE

See also: **The atmosphere** (Gerson), 7.4–12; **Ozone research** (Teichert, Warmbt), 7.4–16; **Ozone bibliog.** (Belmont), 7.4–41; **Rocket exploration of upper atmos.,** 7.4–103; **Ionospheric wind determination** (Court), 7.4–216.

7.4–130 551.510.534:551.524.7

Pressman, Jerome (*Geophysics Res. Directorate, A. F. Cambridge Res. Center*), **Diurnal emperature variations in the middle atmosphere.** *American Meteorological Society, Bulletin,* 5(5):220–223, May **1955.** 9 figs., 12 refs. **DWB**—A computation has been made of the easonal and latitudinal variation of the diurnal temperature changes in the ozonosphere. here was assumed a uniform cooling rate over a twenty-four hour period which exactly balanced he heating due to absorption by ozone of solar energy. The computations indicate that the iurnal temperature variation curve is relatively constant with latitude up to about 75°N titude. The maximum diurnal temperature variation is at about 45 km. *Subject Headings:* **1. Diurnal temperature variations 2. Ozonosphere temperatures.**—*Author's abstract.*

7.4–131 551.510.535:621.396

Bennington, T. W., **Observations of the effects of ionospheric storms over a North Atlantic rcuit.** *Journal of Atmospheric and Terrestrial Physics,* 7(4/5):235–243, Oct. **1955.** 4 figs., able, 3 refs. **DWB**—The maximum usable frequency (MUF) of the WWV signals from Washington received at Tatsfield, England, on 5, 10, 15 and 20 Mc/s were recorded in July–ept. 1953 in normal and disturbed periods and the diurnal variation of monthly medians xtracted. The effect of ionospheric disturbances is to depress the MUF by 10–50%, the reatest reduction occurring between 7–11 h GMT, the least between 12–23 h in summer, 2–20 h at equinox and 12–17 h in winter. The disruptive effect depends also on the value f the MUF at the time, being greater at night than by day, especially in winter. Possible torm effects on the lowest usable frequency (LUF) are briefly discussed. *Subject Headings:* **1. Ionospheric storms 2. Radio transmission.**—*C.E.P.B.*

7.4–132 551.510.535:551.594.7:621.396.11

Bramley, E. N., **Some aspects of the rapid directional fluctuations of short radio waves eflected at the ionosphere.** *Institution of Electrical Engineers, London, Proceedings, Pt. B,* 102(4):533–540, July **1955.** fig., 2 tables, 14 refs., 48 eqs. **DLC**—Measurements have been nade of the rapid directional fluctuations observed on single-component first-order ionospheric echoes, at vertical and oblique incidence (range 700 km), and on frequencies of 2.5–10.5 Mc/s. Under quiet ionospheric conditions the r.m.s. angular deviations are of the order of 1° or less, ut they are appreciably greater under ionospheric-storm or spread-F conditions. The luctuations are uncorrelated at an interval of 5 sec. It is shown that a layer of irregular onization-density within region E would account for the quiet-condition F-layer results, and his would require random variations of the phase path through the region of the order of only m at frequency of 5 Mc/s. The E-layer results appear to be affected by partial reflections t different levels within the region. *Subject Headings:* **1. Short wave reflection 2. Ionospheric reflection.**—*Author's abstract.*

7.4–133 551.510.535:523.75

Ellison, M. A. (*Royal Observatory, Edinburgh*), **The $H\alpha$ radiation from solar flares in elation to sudden enhancements of atmospherics on frequencies near 27 Kc/s.** *Journal of Atmospheric and Terrestrial Physics,* London, 4(4/5):226–239, **1953.** 5 figs., 2 tables, 18 refs.

DWB—The development curves of 10 solar flares observed in *Hα* light are compared with t sudden enhancements of atmospherics (S.E.A.s) generated by them. In confirmation earlier work (1950), an average time lag of 7 min is established between the maximum of t flare and the maximum of the resulting S.E.A. This is interpreted as an effect of "sluggis ness" in the response of the *D*-layer (at a height of about 75 km) to the ionizing radiation fr the flare. An analysis is made of the association of S.E.A.s with 413 flares of Classes 1, 2 an during a period of 4 years. In the hours between 0900 and sunset 51% of Class 1 flares, 88 of Class 2 flares and all Class 3 flares have associated S.E.A.s. The percentage associati is higher during the middle of the day and in the afternoon than in the early morning hou It is also higher in winter than in summer. It is emphasized that three or four 27 Kc/s record well distributed in longitude would give almost complete coverage for the recording of ma flares; the method might profitably be used during the International Geophysical Year 1957. *Subject Headings:* **1. Solar flares 2. Sudden enhancements of atmospherics 3. Ion spheric disturbances.**—*Author's abstract.*

7.4–134 551.510.535:550.38:621.396.

Heading, J., **The reflexion of vertically-incident long radio waves from the ionosphe when the earth's magnetic field is oblique.** *Royal Society of London, Proceedings, Ser.* 231(1186):414–435, Sept. 6, **1955.** 8 figs., 11 refs., 89 eqs. **DWB**—Approximate equatio are developed for the reflexion of plane electromagnetic waves from a horizontally stratifi anisotropic ionosphere, when the earth's magnetic field is in an arbitrary direction. Tw distinct regions of height arise in the theory, each governed by its respective equations propagation. For the special case of vertical incidence in an oblique magnetic field wh the distribution of electron density is exponential, the equations for the lower region a solved analytically in terms of hypergeometric functions. The equations for the upper regi are solved in terms of generalized hypergeometric functions under more general condition namely for oblique propagation when the plane of incidence coincides with the magne meridian. Explicit expressions in terms of Γ functions of complex arguments are obtain for the reflexion and transmission coefficients of the lower region, and for the reflexion a conversion coefficients of the upper region. The theory is illustrated numerically by a typic model. *Subject Headings:* **1. Ionospheric radio wave reflection 2. Geomagnetic effects.** *Author's abstract.*

7.4–135 551.510.535:621.396.

Naismith, R., **Improved chart for ionospheric forecasting in the British Zone.** *Institut of Electrical Engineers, London, Proceedings, Pt. B,* 102(4):503–504, July **1955.** 2 figs., tab **DLC**—An improved form of chart for use in ionospheric forecasting is described. In t international 3-zone system of presenting forecasts of radio-wave transmission condition the necessity to provide average values over a range of longitudes introduces errors. The errors can be eliminated for the region of the United Kingdom by the use of a British Zo Chart (B.Z.C.), which presents the predictions directly for all 2,000 km control points arou London. A comparison by various user organizations showed that, over a test period six months, the standard deviation between the predicted and observed conditions was a proximately halved when the B.Z.C. was used. *Subject Headings:* **1. Ionospheric forecas 2. Radio transmission.**—*Author's abstract.*

7.4–136 551.510.535:621.396

Piggott, W. R., **On the variation of ionospheric absorption at different stations.** *Journ of Atmospheric and Terrestrial Physics,* 7(4/5):244–246, Oct. **1955.** 6 refs. **DWB**—Correlati of day-to-day variations of absorption at 2 Mc/s at Swansea and Slough is about 0.92 both winter and summer. Freiburg-Slough correlation is not directly possible, probably owing discrepancies in deducing the absorption. "After allowing for known sources of error, it considered that the residual differences in summer are too small to be significant, but it probable that real differences occur in winter." *Subject Heading:* **1. Ionospheric absorptio** —*C.E.P.B.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Forecasting techniques** (Pfeffer, Saltzman), 7.4–115; **Precip. mechanism** (Miller), 7.4–231.

7.4–137 551.511:551.513.2

†Jung, Glenn H. (*M.I.T., Cambridge, Mass.*), **Note on the meridional transport of energy in the oceans.** *Journal of Marine Research*, New Haven, Conn., 11(2):139–146, Nov. 1952. figs., refs. **DWB, DLC**—The role of the oceans in providing poleward energy flux within the earth's fluid envelope is re-examined in regard to effective transport mechanisms. A hypothetical model near 30°N lat. is found to produce a sizeable poleward energy transport when effects of closed vertical circulations operating in meridional planes are considered. Available data for the Atlantic do not conflict with this result. It is suggested that the importance of such meridional circulations should not be disregarded in computations of the global energy balance. *Subject Headings:* **1. Meridional transport of kinetic energy 2. Meridional circulation 3. Oceanic influences.**—*Author's abstract.*

7.4–138 551.511:514

Kwizak, M., **Vector analysis with applications to some problems in dynamic meteorology.** *Canada. Meteorological Div., CIR*-2544, TRA-19, Oct. 18, **1954.** 57 p. 37 figs., 5 refs., numerous eqs. **DWB**—Notes based on a series of lectures given to the staff of the Central Office of the Canadian Meteorological Service. The purpose is to provide a refresher course for those who have studied vectors, and background material for those who have not. Examples from dynamic meteorology such as Coriolis force, acceleration, gravity, vorticity, divergence, circulation theorem, and use of coordinates of various types, surfaces, solenoidal fields, are worked out in detail to illustrate use of vectors. *Subject Headings:* **1. Vector analysis 2. Dynamic meteorology.**—*M.R.*

7.4–139 551.511:551.551:551.510.42

Rounds, Wellington, Jr. (*U. S. A. F. Cambridge Res. Center*), **Solutions of the two-dimensional diffusion equations.** *American Geophysical Union, Transactions*, 36(3):395–405, June **1955.** 7 figs., 4 refs., 48 eqs. **DWB**—General solutions of the two dimensional diffusion equation are derived following the work of SUTTON and the profiles of DEACON. These solutions apply to: 1) diffusion of gases and aerosols from sources infinite in cross-wind extent located at arbitrary heights and having arbitrary initial distributions; 2) diffusion of particles with non-zero free fall velocity; and 3) diffusion of gases and aerosols under an atmospheric lid as at the base of an inversion. These solutions are then applied to several types of sources and the down-wind concentrations are presented in graphical form. *Subject Headings:* **1. Diffusion equations 2. Diffusion of gases 3. Dispersion of particles.**—*Author's abstract.*

7.4–140 551.511

Scorer, R. S., **Theory of non-horizontal adiabatic flow in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 81(350):551–561, Oct. **1955.** 5 refs., 48 eqs. **DWB**—The equation of continuity takes the form div $\mathbf{v}=gw/c^2$ when there are appreciable vertical displacements. The stream function, ψ, for two-dimensional steady motion satisfies an equation which for vertical displacements of less than about a kilometer reduces to the form $\nabla = G_1(\psi) - zG_2(\psi)$, where G_1 and G_2 are functions of ψ determined by the profile of the air current entering the region under study. This is probably the best form for numerical solution. Bernoulli's equation shows that $(gz+q^2/2-\tilde{w}/\tau)$ is constant along a streamline in steady diabatic flow. The perturbation equations which have already been widely used are derived as a special case. Except in this case the solution for three-dimensional flow is very much more difficult to obtain than that for two-dimensional flow. The lateral stretching of vortex lines in flow over unlevel ground reduces or increases the surface wind according as the wind increases or decreases with height. This process may be used to explain the location of blowdowns in forests on hillsides. The generation of shear in non-horizontal motion can occur at already existing discontinuities of temperature (or velocity). If the motion is unstable so that turbulence is generated, other things being equal the more stable (statically) the tem-

perature inversion the more likely it is to produce turbulence in mountain waves. *Subj*
Heading: **1. Adiabatic flow.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **West-wind component chart** (Martin, Anderson), 7.4–81; **Meridional transport of energy** (Jung), 7.4–137; **Clear-air turbulence** (Clem), 7.4–197; **Wind velocity,** 7.4–217.

7.4–141 551.513:551.557.2(21

*Gilchrist, A., **Winds between 300 and 100 mb. in the tropics and subtropics.** *Gr*
Britain. Meteorological Office, Meteorological Reports, No. 16, **1955.** 28 p. 15 figs., 2 tabl
22 refs. At head of t.-p. M.O.535 k. **GB-MO**—Winds at 66 stations between 40°N a
40°S were plotted at 300, 200, 150 and 100 mb levels for Jan., April, July and Oct. 19
Cross sections show direction and velocity along 80°W and 45°, 140° and 165°E between 7
and 100 mb. A strong westerly wind belt, which is strongest in winter, exists near latitu
30° in winter and at higher latitudes in summer. This belt may be distinct from the po
jet stream; cross sections at 80°W for individual occasions indicate its structure. The easte
winds on the equatorial side of the westerly winds reach their maximum extent in sumn
when a strong easterly current stretches from the Pacific across southern Asia to Afric
Subject Headings: **1. Atmospheric circulation 2. Upper air winds 3. Tropics.**—*C.E.P.*
and author's abstract.

7.4–142 551.513:551.515(9

*Karelsky, S., **Surface circulation in the Australasian region.** *Australia. Bureau*
Meteorology, Meteorological Study, No. 3, Nov. **1954.** 74 p. 10 refs., 85 figs. **DWB**—T
surface circulations in the Australian region are studied in terms of seasonal distributions
"cyclonicity" and "anticyclonicity." Changes from month to month are compared wi
the distributions of land and sea surface temperature. Attention is drawn to deviations fr
the normal patterns. Winter circulations are classified into certain types of similar distrib
tions of anticyclonicity. Data are presented in numerous graphs and seasonal charts
Australian area. *Subject Headings:* **1. Atmospheric circulation 2. Anticyclones 3. Au**
tralasia.—*Author's abstract, M.R.*

7.4–143 551.513.1:551.557:629.

Rutherford, G. T., **A profile of the jet stream, 9th August, 1953.** *Australian Meteor*
logical Magazine, Melbourne, No. 7:13–25, Nov. **1954.** 5 figs., 2 tables, 4 refs. **DWB**—A
analysis is presented of inflight winds, obtained at short intervals by a jet aircraft flying acr
the jet stream in the vicinity of lat. 30°S. The highly erratic inflight winds are attributed
poor position fix determination, to short time intervals between fixes, and high true air spe
of observing aircraft. A jet profile of limited detail is constructed on the basis of win
computed from good fixes. *Subject Headings:* **1. Jet stream profiles 2. Jet stream flying.**
Based on author's abstract.

7.4–144 551.513.2:551.5

Dickson, Robert R. (*BuAer Project AROWA, Norfolk, Virginia*), **A case study of th**
jet stream. *American Meteorological Society, Bulletin*, 36(5):195–203, May **1955.** 8 figs
table, 5 refs. **DWB**—The author analyzes a case of jet maximum of a northwesterly j
stream not associated with a surface low selected from a series of jet stream flights made duri
the winter of 1953–54. The airplanes were provided with vortex thermometers, V6
accelerometers and data are presented for the levels at 3,000 and 3,500 ft pressure altitud
"Wind shear on the cyclonic side of this jet stream is roughly twice that on the anticyclon
side. Stronger areas of clear air turbulence appear closely related to strong vertical wi
shear. An area of uniform absolute vorticity exists for about 160 nautical mi north of th
jet stream. Measured microvariations of the temperature along a pressure surface—up t
3.1°C in 8.5 nautical mi –give indirect evidence of jet stream 'figures' of high velocity.
Subject Headings: **1. Jet stream analysis 2. Jet stream flights 3. Jet stream analogies.**
Based on author's abstract.

7.4–145 551.513.2:551.557:629.13

Jacobs, Lloyd E. (*James Connally AFB, Texas*), **Navigational aspects of the jet stream.** *Navigation*, Los Angeles, 4(7):242–249, June **1955.** 5 figs., 11 refs. **DLC**—A schematic cross-section of the atmosphere and the jet stream, from 1000 to 100 mb level, and from Arctic to Tropics accompanies an article on jet stream location and flying in the United States and Florida in particular. Knowledge obtained from Project Jet Stream is summarized. Use of D-values to indicate presence of strong winds is emphasized. Gradients of temperatures are 3 times as steep on the cold side as on the warm. The gradient reverses itself above the jet center. This knowledge can assist pilot in finding or avoiding jet winds. Direction of jet can be identified from above by cloud streaks. Local changes of speed of great magnitude are reported in a short time, even in the jet. Maximum change 150 knots in 3000 ft was reported over Tateno (Tokyo). *Subject Headings:* **1. Jet stream flying 2. Jet stream structure 3. Jet stream location 4. Tateno, Japan 5. Florida 6. United States.**—*M.R.*

7.4–146 551.513.2(73)

Klein, William H. (*Extended Forecast Section, U. S. W. B., Wash., D. C.*), **General circulation of 1954.** U. S. Weather Bureau, **1955.** 7 p. 5 figs. **DWB**—The general circulation over the United States is discussed and illustrated for 3 seasons: 1) Dec. 1953 to June 1954 when a two month cycle occurred (hot one month and cold the next); 2) summer and early fall, when a high level anticyclone with a maximum of anticyclonic vorticity at the tropopause, covered the East and SW and brought drought; 3) late fall and winter, starting with the hurricanes, and bringing generally dry weather in the Mid Continental area. Circulation patterns, zonal index values, movement of cyclones and anticyclones, and position of maximum belt of westerlies are shown on charts. *Subject Headings:* **1. General circulation of 1954 2. United States.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Hurricane hunters** (Tannehill), 7.4–5; **Obs. methods of showers & thunderstorms** (Muchnik), 7.4–76; **Radar storm & tornado detection** (A.M.S. Comm. on Radar Met.), 7.4–85; **Atmos. circulation** (Karelsky), 7.4–142.

7.4–147 551.515.2:551.461.2(52)

Ara, Masaru, **Floods on the shore of Hachiro-Kata.** *Journal of Meteorological Research*, Tokyo, 6(10/11):527–532, Dec. **1954.** 4 figs., 2 tables, 2 refs. In Japanese; English summary p. 527. **DWB.** Also in: *Sendai, Japan. Central Meteorological Observatory, Bulletin of the Meteorological Society for Research of Tohoku District*, 8(2):527–532, Jan. **1955. DWB**—Floods are apt to occur along the lee side shore of the Hachiro-Kata (Lagoon) when intense cyclones pass through near the lagoon in the warm season. The author investigated the increase of water level, and obtained the following results: the remarkable increase of the lagoon level over flood area has two different causes: 1) the inclination of the lagoon level which depends on the wind velocity and direction, 2) inflow of rain water. The former is usually a main factor of flood, and the latter accelerates it. *Subject Headings:* **1. Typhoon waves 2. Sea level variations 3. Floods 4. Hachiro-Kata Lagoon, Japan.**—*Author's abstract.*

7.4–148 551.515.2:551.556.1:368.51

Eastern Underwriters Association. *American Meteorological Society, Bulletin*, 36(7):359, Sept. **1955. DWB, DLC**—The Eastern Underwriters Association is a voluntary, nonprofit trade association comprising 148 capital stock fire insurance companies. Its activities include research on the loss potentiality of windstorms and the degree of damage to be expected from wind force associated with hurricanes, tornadoes and thunderstorms. *Subject Headings:* **1. Hurricane insurance 2. Wind damage probabilities.**—*I.L.D.*

7.4–149 551.515.2:551.556.1:63

Honda, Chikayoshi (*Kagoshima Statistical and Investigation Office*), **An example of damages of rice plant by typhoon in the earing date.** *Journal of Agricultural Meteorology*, Tokyo, 9(3/4):101–102, Aug. **1954.** fig., 6 tables. In Japanese; English summary p. 102. **MH-BH**—The late rice plants hit by typhoon "Kezia," Sept. 13, 1950, during the earing date, were most

seriously damaged. The damage done by this typhoon on rice grains is summarized as follow 1) small brown discolored spots appeared on the surface of rice grains especially in the la rice plants just in the earing date; 2) these damaged grains contained more green (unripe and incomplete kernels but less complete, and also some brown kernels, but no deforme kernels were observed; 3) weight of 1,000 kernels of damaged grains decreased about 5% 4) this damage to grain was more serious in glutinous rice than in nonglutinous. *Subje Headings:* **1. Typhoon damage to crops 2. Typhoon "Kezia" (1950) 3. Rice yield 4. Japa** —*Author's abstract.*

7.4–150 551.515.

Hubert, Lester F. (*U. S. W. B., Wash., D. C.*), **Frictional filling of hurricanes.** *America Meteorological Society, Bulletin*, 36(9):440–445, Nov. **1955.** 2 figs., table, 4 refs., eqs. **DWI DLC**—As a hurricane moves from ocean to land, the surface roughness and the wind stre increase, which in turn causes the surface wind to blow across the isobars at an increased angl The resulting increase in mass convergence in the surface friction layer is examined in the ligh of the Rossby-Montgomery theory on the influence of friction on surface flow, and the resul are compared with the analysis of fifty years of hurricanes that moved into the United State Those hurricanes are also analyzed to study the rate of pressure gradient decrease in th maximum wind zone. The results of this study indicate that frictional effect alone cann dissipate the dangerous winds of a mature hurricane within the first eight to ten hours aft moving onshore, but that dissipation is controlled essentially by the energy budget. *Subje Headings:* **1. Hurricane dynamics 2. Frictional effects on hurricanes.**—*Author's abstract.*

7.4–151 551.515.2(74

Narragansett Times, [Wakefield, Rhode Island], **Carol was here: a pictorial chronicl of the hurricane in South County, Aug. 31, 1954.** Sept. **1954.** 36 p. numerous photo **DWB**—Brief account, and excellent photos, of events attending the Aug. 31, 1954 Hurrican "Carol," and damage done along the Rhode Island Coast. Warnings were received in tim for the Navy to move planes out of Quonset and state police to warn South County shor dwellers to evacuate before tide reached flood stage. Many did not heed warnings and wer caught by the storm. Barograph traces for "Carol" and "Edna" are reproduced. *Subje Headings:* **1. Hurricane "Carol" (1954) 2. Hurricane damage photographs 3. South County Rhode Island.**—*M.R.*

7.4–152 551.515.2(914):551.509.

Philippines. Weather Bureau, **Storm warning procedures.** *Philippines. Weath Bureau, PWB Circular*, No. 15, Sept. 1, **1949.** plate, form, 2 refs. Mimeo. **DWB**— review of general knowledge about typhoons in the Far East, with enough technical informatio to permit the observer or receiver of the forecasts to understand how to report the indication of approaching storm or to make proper use of the warnings. The contents of the warnings the distribution, places where visual warnings are displayed and other information are include in this manual. *Subject Headings:* **1. Typhoon warning services 2. Observers manual 3. Philippine Islands.**—*M.R.*

7.4–153 551.515.2(74

Providence [Rhode Island] Journal, **Hurricane Carol lashes Rhode Island, Aug. 31 1954.** Pub. by the Providence Journal Co., **1954.** 80 p. mostly photographs. **DWB**— A vivid pictorial and descriptive account of the second worst hurricane in the history of Rhod Island—caused greatest property damage ($200,000,000) but only 19 dead compared wit 317 dead in 1938 storm. Water rose 4–8 ft in downtown Providence. The path of the storm flood scenes in Providence and on beaches, destruction by wind and tide (trees, dwellings boats, cars, etc.) and reconstruction activities, are well illustrated. Comparative picture for 1938 are also included. "Edna," which came 11 days later, did little damage as it passe to the east of Rhode Island, and tide (as in 1944 hurricane) was on the ebb. *Subject Headings* **1. Hurricane "Carol" (1954) 2. Hurricane damage photographs 3. Providence, Rhod Island.**—*M.R.*

7.4–154 551.515.2:656.61

Rodewald, Martin, **Ausmanövrieren des tropischen Wirbelsturms "Diane" 11. bis 13. August 1955. Berichter: 1. Offz. Ph. Knoeckel, 2. Offz. H. J. Klock.** [Maneuvring in the tropical cyclone "Diane". . . .] *Wetterlotse*, No. 94/95:216–229, Nov./Dec. **1955.** 4 figs. **DLC**—The M.S. "Coburg" (Haiti to Europe) received the first hurricane warning on Aug. 11. The track as plotted on board (which differed from that given by Washington) and the avoiding action taken are shown. The observations on the "Coburg" and the warnings received are tabulated, and some remarks on the peculiarities of this asymmetric hurricane are added. *Subject Headings:* **1. Hurricane "Diane" (1955) 2. Navigation in hurricanes.**—*C.E.P.B.*

7.4–155 551.515.2(261)

Rodewald, M., **Hurrikan-Saison 1955 schon bis JANET.** [Hurricane season 1955 already up to Janet.] *Wetterlotse*, Hamburg, No. 93:206–207, **1955. DLC**—Brief account of the 10 hurricanes which struck N. America before the end of Sept. 1955. *Subject Headings:* **1. Hurricanes 2. North America.**—*C.E.P.B.*

7.4–156 551.515.2(265)

Rodewald, M., **Motorschiff "Schwabenstein" im Gefecht mit Taifun "Ruby."** [Motorship "Schwabenstein" battling typhoon "Ruby".] *Seewart*, Hamburg, 16(3):74–79, June **1955.** 2 figs., table. **DWB**—Weather conditions from ships log are quoted and track of typhoon in W. Pacific and S. China Sea is shown for Nov. 6–11, 1954, as forecast, and as actually observed, with the track of the "Schwabenstein" which paralleled the typhoon path for 2 days also shown. The typhoon slowed down about 100% as it passed into the China Sea and became very erratic in direction, making it difficult for the forecasters, let alone the ship's captain, to keep out of its orbit. A small typhoon had preceded "Ruby" by 3 or 4 days in the area. *Subject Headings:* **1. Typhoon "Ruby" (1954) 2. West Pacific.**—*M.R.*

7.4–157 551.515.2:656.61

Rudloff, D. and Rodewald, M., **Bericht über das Zusammentreffen des M.S. "Berlin" mit dem Hurrikan "IONE" am 20. September 1955.** [Report on the encounter of the M.S. "Berlin" with the hurricane "Ione" on Sept. 20, 1955.] *Wetterlotse*, No. 94/95:230–236, Nov./Dec. **1955.** 3 figs. **DLC**—The "Berlin" received first warning of "Ione" on Sept. 14, and on the 19th changed course to the south to avoid it if it followed a normal parabola, but the hurricane changed direction to the east. Oil and water ballast were pumped overboard and the ship continued to SSW and passed south of, though near, the center. *Subject Headings:* **1. Hurricane "Ione" (1955) 2. Navigation in hurricanes.**—*C.E.P.B.*

7.4–158 551.515.2:551.556.1:77(744)

Standard-Times, [New Bedford, Mass.], and The Cape Cod Standard-Times, [Hyannis, Mass.], **Hurricane 1954, August 31–Sept. 11.** pub. **1954?** unpaged. mostly photos with legends. **DWB**—Statistics of the loss of life and damage to property in Southeastern Mass. and dozens of vivid pictures of flood and wind damage tell the story of the disaster attending hurricane "Carol" on Aug. 31, 1954 in the Cape Cod, Martha's Vineyard and Woods Hole area. *Subject Headings:* **1. Hurricane damage photographs 2. Hurricane "Carol" (1954) 3. Cape Cod, Mass.**—*M.R.*

7.4–159 551.515.2

U. S. Inter-Agency Conference on Hurricane Research, Washington, D. C., Dec. 16–17, 1954, **Provisional minutes.** Jan. 12, **1955.** 11 p. Mimeo. **DWB**—The conference was held under the chairmanship of H. WEXLER. SIMPSON of U. S. W. B. outlined 10 aspects of hurricane structure or kinematics that require further research if forecasting is to progress. RIEHL, DUNN, HUBERT, WEXLER, BAUM, LA SEUR, CRESSMAN, FLETCHER and others discussed reconnaissance, radar, synoptic data collection, network and other phases of hurricane research. *Subject Headings:* **1. Hurricane research. I. Wexler, Harry.**—*M.R.*

7.4–160 551.515.2:551.501.7

§U. S. Navy. Meteorological Squadron 1, **Typhoon reconnaissance . . . May through November 1947.** Wash., D. C., Aerology Flight Section, Chief of Naval Operations, Jan.

1948. 254 p. illus., charts (some fold.). *U. S. Office of Naval Operations, NAVAER* 50 IR-206A. **DLC**—By means of photographs, cross sections, surface synoptic charts and chart showing course of plane, observations at fixed points, etc., the history of typhoons of Ma through Nov. 1947 is vividly portrayed. Fifteen typhoons were encountered in the Wester Pacific by the U. S. Pacific Fleet Air Force, and the track of each, as determined by caref reconnaissance, determined and shown on separate charts. *Subject Headings:* **1. Typhoo reconnaissance 2. Typhoon tracks 3. Synoptic studies 4. Western Pacific.**—*M.R.*

7.4–161 551.515.2:551.577.37:551.577.61:551.579.4(73

U. S. Weather Bureau, **Preliminary report of Hurricane Diane and floods in Northeas Aug. 1955.** Aug. 25, **1955.** 4 p. chart. **DWB**—Hurricane rainfall during passage o "Diane" (Aug. 17–19, 1955), following less than a week after "Connie" which saturated th soil in eastern Pennsylvania, New York and New England, caused the worst floods in histor in a number of valleys, where water rose in a matter of hours to as high as 10 ft above highes recorded stage. Floods occurred in heavily populated and industrialized areas, so that mor than 175 lives were lost and $1.6 billion damage estimated. High winds (peak gust 74 mp at Wilmington, N. C.) were confined to N. Carolina Coast. Tides were 2–4 ft. above norma in estuaries. Flood and precipitation data are tabulated or charted for area traversed b "Diane" Aug. 17–20 during its overland course. Rainfall up to 16.30 in. was recorded i S.W. Mass. and 14 in. at Windsor Locks, Conn. *Subject Headings:* **1. Hurricane "Diane" (1955) 2. Record rainfall 3. Record floods 4. Disasters 5. Northeast United States** —*M.R.*

7.4–162 551.515.2:525.6

Wadati, K. and Korno, R. (*both Central Met. Obs. and Met. Res. Inst., Tokyo*), **Storm tide caused by typhoons.** (In: UNESCO Symposium on Typhoons, Tokyo, Nov. 9–12, 1954 **Proceedings,** pub. **1955.** p. 31–48. 13 figs., 13 tables, 19 refs.) **DWB**—The major storm tides which have occurred along the coastal waters of Japan from 1900 to 1953 are listed and their frequency of occurrence are shown on a map. The characteristics of the storms in the areas of their most frequent occurrence, namely: Tokyo Bay, Osaka Bay, the Inland Sea, the Ariake Sea, Toyama Bay and Suruga Bay are described with the aid of mareograms of storm tides and map. Storm tides are classified into two types viz: quasistatical use of sea level (astronomical high tide, piling up of sea water along the coast by drift current, statical and dynamical, and suction of the water by low pressure, statical and dynamical) and large swell The problem of disaster prevention is considered. *Subject Headings:* **1. Storm tides 2. Typhoons 3. Japan.**—*I.L.D.*

7.4–163 551.515.21

Aoki, Shiichi (*Nara Weather Station, Nara, Japan*), **On the structure of disastrous typhoons hitting the Japanese Islands (a summary note of the theory of main and secondary typhoons).** (In: UNESCO Symposium on Typhoons, Tokyo, Nov. 9–12, 1954, **Proceedings** pub. **1955.** p. 61–77. 11 figs., 2 tables, 7 refs.) **DWB**—T. Namekawa's theory that severe typhoons are composed of two different kinds of cyclonic systems (main and secondary typhoons) is summarized and the synoptic characteristic of typhoons derived in this theory are confirmed by an analysis of the Makurasaki Typhoon of Sept. 17, 1945. The method of identification of the secondary typhoon, the synoptic evidence for the existence of main and secondary typhoons are analyzed. An equation developed by Namekawa is used to explain the behavior of the quasi-stationary character of the main typhoon and the decay inside of the secondary typhoon. *Subject Headings:* **1. Typhoon structure 2. Cyclone theory.**—*I.L.D.*

7.4–164 551.515.21

Simpson, R. H. (*U. S. Weather Bureau*), **On the structure of tropical cyclones as studied by aircraft reconnaissance.** (In: UNESCO Symposium on Typhoons, Tokyo, Nov. 9–12 **Proceedings,** pub. **1955.** p. 129–150. 19 figs., 10 photos.) **DWB**—In this comprehensive review the author discusses the use of reconnaissance aircraft in the study of hurricane vortices of the simple hurricane model. The thermal structure, the storm circulation, the cloud structure as indicated by reconnaissance data, the revised hurricane model on the basis of

reconnaissance information, and the use of the electronic beacon device to follow the movement of hurricanes are discussed. Photograph of the eye of "Edna," diagram of hurricane circulation, of cloudiness, of synoptic analysis in the vicinity of specific hurricanes, etc. are presented. *Subject Headings:* **1. Hurricane structure 2. Hurricane models 3. Hurricane reconnaissance.** —*I.L.D.*

7.4–165 551.515.23(713)

§Knox, J. L. (*Canadian Met. Service*), **The storm "Hazel": synoptic résumé of its development as it approached Southern Ontario.** *American Meteorological Society, Bulletin*, 36(6): 239–246, June **1955.** 10 charts, append. p. 246. **DLC, DWB**—This detailed synoptic account of the development of the storm "Hazel" over the mainland includes a discussion of the hurricane stage over the Atlantic low latitudes, the synoptic development before its penetration of the mainland, the interaction of Hurricane "Hazel" and the Polar Front, the extra-tropical cyclone state, the causal basis of the Ontario flood and the wind characteristics. Synoptic surface charts association with various stages in the life of the hurricane, isohyets of 48 hr rainfall in Toronto area and a table giving hourly wind speeds and temperatures at Malton are included. *Subject Headings:* **1. Hurricane "Hazel" (1954) 2. Hurricane development 3. Hurricane tracks 4. Southern Ontario, Canada.**—*I.L.D.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Twilight sodium lines** (Vegard et al.), 7.4–13; **Radiation climate** (Stolley), 7.4–78; **Solar constant corrections** (Schüepp), 7.4–79; **Radiation networks & instruments** (Albrecht), 7.4–86; **Global solar radiation** (Ashbel), 7.4–89; special bibliography on **Cosmic Rays in the Atmosphere (1953–1955)**, p. 488.

7.4–166 551.521:615.831

Albani, Félix, **Perspectivas de aprovechamiento de la energía solar e información básica meteorológica necessaria.** [Outlook for the utilization of solar energy and the basic meteorological information necessary.] *Meteoros*, Buenos Aires, 4(3):245-250, July/Sept. **1954.** 11 refs. **DWB**—The author discusses the energy content of solar radiation at various latitudes in the U. S., describes various types of sunshine collectors and their efficiency in the U. S. and France, and considers the use of solar energy for heating. The types of meteorological data needed for using solar energy are summarized and listed. *Subject Headings:* **1. Solar energy utilization 2. Solar radiation 3. United States 4. France.**—*I.L.D.*

7.4–167 551.521.12(94)

*Australia. Bureau of Meteorology, **Australian radiation records, Jan. 1954-June 1954.** Melbourne, [1955?] 4 p. mostly tables. **DWB**—Regular country-wide global and spectral radiation records were first made in Australia in 1950 under the auspices of the Commonwealth Meteorological Bureau and the University of Melbourne Department of Meteorology. The present bulletin gives for each month mean values of global radiation in millicalories sq cm/min for Jan. through June 1954, and daily values in cal/sq cm/day for Guildford, Western Australia; Alice Springs and Darwin, Northern Territory; Garbutt, Queensland; Williamtown, N.S.W.; and Box Hill, Victoria. A special research program was set up at Box Hill near Melbourne, as the first radiation research station in Australia. The initial pub. of Australian Radiation Records, Oct. 1954 contained similar data for 1953. *Subject Headings:* **1. Radiation networks 2. Radiation data 3. Australia 4. Box Hill, Victoria, Australia.**—*M.R.*

7.4–168 551.521(05)

*World Meteorological Organization. Regional Assoc. I, **Quarterly Radiation Bulletin. Bulletin Trimestriel du Rayonnement.** vol. 1, No. 1, **1955.** Quarterly. No. 1, 31 p. mostly tables. Issued by the South Africa Weather Bureau, for the WMO Regional Association I, Working Group on Radiation. Pref. signed T. E. W. Schumann. In French and English. Also: Review by A. J. Drummond in *South Africa. Weather Bureau, News Letter*, No. 73:5,

April 30, **1955. DWB**—This Bulletin has been prepared with the aid of punch-card machine methods and will consist normally of four issues per year "presenting data for a period roughly three to six months in arrear." The first two volumes will contain supplements with data from stations not included at the beginning of the scheme and from African radiation stations prior to Jan. 1954. In this issue the data cover the period July 1–Sept. 30, 1954. They consist of hourly values of total and diffuse sky radiation for Bloemfontein, Cape Town, Durban, Pretoria, Windhoek, Bulawayo, Tananarive, Elisabethville and Leopoldville; and daily summation of total radiation for Stanleyville and Yangambi Station. Station coordinates, zone times and reference numbers of radiometers and recorders are given. *Subject Headings:* **1. Radiation bulletins 2. Periodicals 3. Radiation data 4. South Africa. I. South Africa. Weather Bureau II. Schumann, T. E. W. III. Drummond, A. J.**—*I.L.D.*

7.4–169 551.521.1:621.47

French sun furnace receives U. S. Patent. *Science News Letter*, Wash., D. C., 27(21):328, May 21, **1955. DLC**—The world's biggest sun furnace in the French Pyrenees is composed of giant composite mirrors arresting the sun's heat energy. The sun furnace, illustrated on the cover of this publication, consists of two great mirrors, one of which is a 105-square yard parabola made up of individual small mirrors. The capacity of this furnace is 5,432°F. This invention is covered by U. S. Pat. No. 2707903. *Subject Headings:* **1. Solar energy utilization 2. Solar furnaces.**—*W.N.*

7.4–170 551.521.16

*Dogniaux, R., **Ensoleillement et orientation en Belgique. V. Étude de l'éclairement lumineux naturel.** [Insolation and orientation in Belgium, 5. Study of natural illumination.] *Belgium. Institut Royal Météorologique, Ser. B*, No. 12, **1954.** 76 p. 14 figs., 7 tables. **DWB**—A study of climatology in Belgium in relation to the orientation of the receiving surfaces, the development of the seasons and atmospheric conditions. It is based on the only available data—illumination of horizontal surfaces measured with the aid of a Macbeth visual illuminator. The distribution of luminance was achieved on the basis of H. H. Kimball's curves of mean illumination distribution for Washington in 1924 during clear sky. The determinations of absolute values were made by comparison of calculated values with such measured on a horizontal surface. After defining various terms, the author calculates separately direct (coefficient of visibility) global and diffused radiation during clear and overcast sky on a horizontal and vertical surface during perfect weather. Numerous graphs, charts and tables showing: heights and azimuths of the sun in local hours as a function of the sun's declination, near luminance of the sky in relative units during clear and partly cloudy sky at various sun's heights, the solar and global illumination on differently oriented surfaces and its yearly variation, are included. (For Pts. 1, 2 and 3, *see* 2.11–91, Nov. 1951; for Pt. 4, *see* 3.7–9, July 1952, *MAB*.) *Subject Headings:* **1. Illumination data 2. Illumination intensity 3. Illumination meters 4. Belgium.**—*A.M.P.*

7.4–171 551.521.16:551.510.42(421)

*Helliwell, N. C. and Blackwell, M. J., **Day-time darkness over London on January 16, 1955.** *Meteorological Magazine*, London, 84(1001):342–348, Nov. **1955.** 5 figs., 2 tables, 2 refs. **DWB**—A depression moving E across England brought an occlusion and low level inversion below which smoke from London moved NW to the Chiltern Hills, where it accumulated. Behind a cold front the mass then returned south-eastward as a belt of darkness 1–18 mi wide, passing in 5–15 min. Daylight illumination fell from 7 klux to nearly zero. Some convergence and vertical motion were involved. *Subject Headings:* **1. Daylight obscuration 2. Atmospheric pollution 3. London, England.**—*C.E.P.B.*

7.4–172 551.521.2:660.048

We will drink the sea. *Science News Letter*, Wash., D. C., 68(6):90–91, Aug. 6, **1955. DLC, DWB**—Various methods of obtaining fresh water from salt water are mentioned. Solar distillation is practicable on life rafts, battleships and even in electric plants such as at Morro Bay in Southern California, though cost is $500/acre ft. If costs could be reduced to $150/

acre ft, it would be comparable with most expensive installations using natural water supply. Conventional stills, solar stills, electrolytic methods, precipitation of salt and freezing are among methods discussed. *Subject Headings:* **1. Sea water distillation 2. Solar stills.**—*M.R.*

7.4–173 551.521.4

†Bates, D. R. and Dalgarno, A. (*both, Queen's Univ., Appl. Math. Dept., Belfast*), **The altitudes of the luminous layers in the earth's atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(3):112–123, **1953.** 3 tables, 51 refs., 25 eqs. **DWB**—The claim of the observers that the main features of the airglow (other than the Meinel hydroxyl bands) originate from altitudes as great as several hundred kilometers is disputed. Consideration is given to the various excitation mechanisms which might conceivably be operative but even on the most favorable assumptions none appears likely to be sufficiently effective at such altitudes. In the case of certain of the emissions, such as the *D* lines of sodium, it is contended that the theoretical arguments are unequivocal. *Subject Headings:* **1. Luminescent layer heights 2. Airglow.**—*Authors' abstract.*

7.4–174 551.521.4:535.33

Chamberlain, Joseph W. and Roesler, Frederick L. (*both, Yerkes Observ.*), **The OH bands in the infrared airglow.** *Astrophysical Journal*, Chicago, 121(2):541–547, March **1955.** 2 figs., 4 tables, 16 refs., 2 eqs. **DLC**—A series of infrared airglow spectra have been made at 70 A/mm, in order to obtain accurate wave lengths of the high-excitation ($v'=8$ and 9) Meinel *OH* bands. Band origins have been measured with a very small probable error, and the agreement between the airglow 6–2 and 5–1 bands with earlier high-dispersion measurements in the laboratory indicates that there are no appreciable systematic errors such as plagued previous airglow measurements. In order to represent accurately all energy levels up to $v=9$, it is necessary to use five terms in the usual power series involving ω_e, $\omega_e\pi_e$, etc. These vibrational levels are discussed, and a possible blending of airglow lines with O_{II} in the infrared auroral spectrum is pointed out. *Subject Heading:* **1. Night airglow spectrum.**—*Authors' abstract.*

7.4–175 551.521.4:546.33

Ogawa, Masaru, **On the origin of sodium D-lines in the nightglow and twilight flash.** *Tokyo. University of Education. Institute for Optical Research, Science of Light*, 3(1):47–61, Aug. **1954.** 8 figs., table, 15 refs., 26 eqs. **DWB**—The low pressure reactions of sodium with atomic oxygen, molecular oxygen and ozone have been investigated in order to make laboratory check of CHAPMAN's process of the nightglow. Sodium vapor reacts with ozone in the gas phase accompanied only by the emission of D lines which are slightly diffuse. The velocity of reaction between atomic sodium and ozone is larger than that between atomic sodium and molecular oxygen. On the basis of experimental results and in consideration of the dissociation energy of NaO, one plausible process to explain the above chemiluminescence is set forth, which differs from that of CHAPMAN. It is impossible, however, to attempt to attribute to this process the origin of the sodium D lines in the nightglow and the twilight flash in the upper atmosphere. CHAPMAN's process would appear to be endothermic and therefore not plausible. *Subject Headings:* **1. Sodium D line 2. Night airglow spectrum 3. Twilight sodium spectrum.**—*Author's abstract.*

7.4–176 551.521.61:523.78

*Iaroslavtsev, I. N., **Nabliudeniia infrakrasnoĭ radiatsii vo vremia solnechnogo zatmeniia 30 iiunia 1954 g. v Tashkente.** [Observations on infrared radiation during the solar eclipse of June 30, 1954 in Tashkent.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:185–186, March/April **1955.** figs., 3 tables. **DLC**—Infrared radiation diffused by the sky was measured with a Ianishevskii pyranometer. At time of the eclipse the absolute values of infrared diffuse radiation altered within the limits of 0.76×10^{-2} to 2.6×10^{-2} cal/cm²/min which constitutes from 76% to 19% of the energy of the total radiation flux diffused by the sky and observed at that physical moment. Curves showing the variation of infrared radiation scattered by the sky during the eclipse and percent constitution of infrared radiation of the total radiation

flux in the absence of and during an eclipse are presented. *Subject Headings:* **1. Infrared radiation measurement 2. Solar eclipse, June 1954 3. Tashkent, U.S.S.R.**—*I.L.D.*

7.4–177 551.521.63:581.1

Bühnemann, F., **Ultraviolette Sonnenstrahlung und Pflanzenwachstum.** [Ultraviolet solar radiation and plant growth.] *Naturwissenschaftliche Rundschau*, 8(12):485, Dec. **1955. DWB**—Account of various investigations into effects of UV radiation on plant growth. More than the optimal amount may delay or distort development in spring. *Subject Headings:* **1. Ultraviolet effects 2. Plant physiology.**—*C.E.P.B.*

7.4–178 551.521.63:551.507.362:551.501

Byram, E. T.; Chubb, T. and Friedman, H. (*all, U. S. Naval Res. Lab., Wash., D. C.*), **The study of extreme ultraviolet radiation from the sun with rocket-borne photon counters.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W., eds., **Rocket exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 276–278. fig., 11 refs.) **DWB**—This paper describes briefly measurements of the intensity of the extreme solar ultraviolet spectrum (1050–1250 Å) at heights from 70–100 km. The absorption of the Lyman alpha line of the sunlight in the upper atmosphere is also considered. *Subject Headings:* **1. Ultraviolet radiation measurement 2. Rocket research.**—*Authors' abstract.*

TEMPERATURE

See also: **Temp. data** (Barbanti-Silva, Depietri), 7.4–94; **Diurnal temp. variations** (Pressman), 7.4–130; **Thermal influence on pressure wave** (Haurwitz), 7.4–195; **Damaging cold wave** (Kibler, Martin), 7.4–210.

7.4–179 551.524:536.2

Čadež, Marjan, **Toplotna provodljivost vazduha.** [Heat conductivity of the air.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 3(3/4):118-119, July/Dec. **1954. DWB**—Brief note explaining physical characteristics of the heat conductivity factor and listing heat conductivity (in cal m^{-1} temp. $grad.^{-1}$ sec^{-1}) for air at 0°C (0.0000053) and for snow, water, ice, sand, granite, paddy soil, iron and copper. *Subject Heading:* **1. Heat conductivity of air.** —*G.T.*

7.4–180 551.524(612):551.506

*Fantoli, Amilcare, **I valori medi della temperatura in Libia.** [Average temperatures in Libya.] *Società Geografica Italiana, Rome, Bollettino, Ser.* 8, 7(1/2):59–71, Jan./Feb. **1954.** tables. **DWB**—Average, maximum and minimum mean and absolute maximum and minimum temperatures are tabulated for 48 stations in Libya for each months of the year for periods of varying length. Seasonal temperature limits in the various climatic zones are indicated. Merits of the Italian Government in establishing and maintaining meteorological stations in Libya are mentioned. *Subject Headings:* **1. Temperature data 2. Libya.**—*G.T.*

7.4–181 551.524.1

Sprawl on ground. *Science News Letter*, 68(3):47, July 16, **1955. DWB**—Contrary to adopted theories on air layers very close to the ground, it is established that the temperature drops sharply for the first 2½ in., from there it rises gradually with altitude. If air is undisturbed, the temperature difference becomes more pronounced with time. The observations, employing sensitive thermometers, were made in winter but are valid in summer too. *Subject Headings:* **1. Temperature microvariations 2. Vertical temperature variations.**—*W.N.*

7.4–182 551.524.31:551.584.31(52)

Mano, Hiroshi and Okazaki, Genji (*Sendai Met. Obs.*), **Sudden increase of nocturnal temperatures in valleys or basins.** *Journal of Agricultural Meteorology*, 9(2):53–55, March **1954.** In Japanese; English summary p. 55. 3 figs., table. **MH-BH**—The sudden increase of nocturnal temperature on the northern slope of the Ocho Valley occurs during clear nights and consists of a sudden periodic rise at the middle of the slope, at the top and foot of the slope

such a periodicity does not occur. A study of similar increases in night temperatures at nawashiro (foot of Mt. Bandai) and at Funatsu (foot of Mt. Fuji) indicates that the characteristics of the beginning and end, duration, amplitude and night oscillation of this phenomenon are related to the relative distance of the upper part of the valley to the station, to the area of lake and land of the basin, to the elevation of the station and to stability. *Subject Headings:* **1. Nocturnal temperature rise 2. Slope microclimatology 3. Japan.**—*Based on authors' abstract.*

7.4–183 551.524.36:551.578.45(42)

Booth, R. E., **An exceptionally cold day in May.** *Meteorological Magazine*, London, 84(999):288–289, Sept. **1955. DWB**—On May 17, 1955, England and Wales lay in a strong northerly air stream; up to 4 in. of snow fell. Maximum temperatures of 36–40°F were recorded in Wales and Pennines. *Subject Headings:* **1. Temperature extremes 2. Snowstorms in spring 3. England 4. Wales.**—*C.E.P.B.*

7.4–184 551.524.36

Court, Arnold and Parmelee, Owen S., **Hottest temperatures in the United States.** *U. S. Quartermaster Corps. Research and Development Branch. Environmental Protection Section, Memorandum Report*, No. 38, June **1948.** 10 p. 5 figs., 4 tables, 18 refs. **DWB**—Temperatures of 121°F have been recorded on the Great Plains and 134°F in Death Valley, California. Analysis of the frequencies with which such high temperatures occur and of the conditions at their times of occurrence results in the conclusion that the hotest natural environmental conditions which may be expected are: ground surface 180°F, and air temperature 165°F at 1 inch, 150°F at 1 foot, and 125°F at 5 feet above the ground. It is considered unlikely that air temperature (at 5 feet) will remain above 120°F for more than 4 hours. (*See also* 4.10–2, Oct. 1953, *MAB.*) *Subject Headings:* **1. Extreme temperatures 2. United States.**—*Authors' abstract.*

SOIL TEMPERATURE

7.4–185 551.525.2

Sato, Sho-ichi (*Kyushu Agr. Exp. Sta.*), **Average temperature of soil-strata in the paddy field, and its effects on the rice-crop.** *Journal of Agricultural Meteorology*, Tokyo, 8(12):1–3, March **1953.** fig., table, 5 refs. In Japanese; English summary p. 3. **DWB**—The optimum temperature, represented by average of soil-strata, for the rice crop is about 27°C during the vegetative period of the rice plant and 20–25°C during reproductive period. The average temperature of the soil-strata, exceeding 30°C, is injurious to the rice crop to some extent. The critical temperature of soil strata is some degrees below 20°C. Large daily range of soil temperature is not essential to a good harvest of rice, but it often diminishes the damage due to either extremely high or abnormally low temperatures. *Subject Headings:* **1. Soil temperatures 2. Rice paddies 3. Crop yield.**—*H. Arakawa.*

7.4–186 551.525.4:551.11

Liubimova, E. A., **Rol' temperaturoprovodnosti v teplovom rezhime zemli.** [The role of temperature conductivity in the thermal regime of the earth.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:523–525, **1953.** 2 figs., 3 refs., 2 eqs. **DLC**—The results of calculations of the temperature for a homogeneous model of the earth for varying coefficients of heat conductivity—$k = 1$; 0.1 and 0.01, are reported. The formula with which the calculations were made is given. *Subject Headings:* **1. Earth temperatures 2. Geophysics.**—*I.L.D.*

7.4–187 551.525.4(494)

*Primault, B., **Les températures dans le sol, à Zurich, au cours de l'année 1952.** [Soil temperatures at Zurich during 1952.] *Switzerland. Meteorologische Zentralanstalt, Annalen*, Vol. 90, **1953.** pub. 1954. (10 p. following Anhang No. 7.) 15 figs. (1 fold., also photos), 10 tables, 15 refs. **DWB**—Tables give mean hourly soil temperature at Zurich for each month and for the year at 0, 2, 10, 20, 50 and 100 cm depth. A thorough analysis of data, accompanied by graphs and selected tabular material, is included. Instruments are described,

errors of instrument, exposure, time of reading, etc., discussed, and conclusion reached that a good network of soil temperature measuring stations is needed in Switzerland because of the diversity of climate, terrain and cover. The lag in insolation penetration to 100 cm is about 96 hrs. Recording equipment with resistance rather than mercury thermometers is recommended. The mean of the 8 h and 18 h readings does not differ from the mean of 24 hourly readings by more than the instrumental error. *Subject Headings:* **1. Soil temperature measurement 2. Soil temperature data 3. Zurich, Switzerland.**—*M.R.*

7.4–188 551.525.4:551.311.1

†Robin, G. de Q., **Ice movement and temperature distribution in glaciers and ice sheets.** *Journal of Glaciology*, 2(18):523–532, Oct. **1955.** 5 figs., 2 tables, 20 refs., 16 eqs. English and German summaries p. 523. **DWB**—Heat flow in stable ice sheets of central thickness 3000 and 400 m is calculated for various rates of accumulation, taking geothermal outflow as 3 $cal/cm^2/yr$. Even a small accumulation has a considerable effect on temperature distribution. Heat supply at base due to shearing, and variation of surface temperature with height above sea level, are also considered. With a moderate accumulation outward movement of ice may cause a temperature gradient increasing downwards. Some temperatures in the Greenland and Antarctic ice sheets are found to fit the calculated figures qualitatively. A sketch of the distribution in Greenland is given. Among the consequences it is found that if the ice accumulation fell to 10 cm a year the basal equilibrium temperature would rise to 0°C. This may explain the lower ice cap in North Greenland, and catastrophic advances of glaciers which may be set off by climatic changes. *Subject Heading:* **1. Temperature in glaciers.**—*C.E.P.B.*

WATER TEMPERATURE

7.4–189 551.526.6(268.2):551.465

Metcalf, William G., **On the formation of bottom water in the Norwegian Basin.** *American Geophysical Union, Transactions*, 36(4):596–600, Aug. **1955.** 2 figs., table, 3 refs. **DWB**—The formation of Norwegian Basin bottom water has generally been considered to result from surface cooling during March, April and early May followed by overturning of the water column to produce homogeneity throughout. Recent data confirm much of the earlier theory but suggest that the cooled surface water may flow toward the bottom along a gently tilted path, and that a homogeneous water column may not play any role in bottom water formation. *Subject Headings:* **1. Oceanic circulation 2. Sea temperature 3. Norwegian Basin.**—*Author's abstract.*

7.4–190 551.526.6

Nakayama, Itizo (*Maizuru Marine Obs.*), **Standard deviation and confidence limit of sea surface temperature in the Japan Sea.** *Japan. Central Meteorological Observatory, Oceanographical Report*, 3(4):257–263, Dec. **1949.** 2 tables, 3 figs., 8 refs., eqs. In Japanese; English summary, p. 257. **DWB**—The author calculated the standard deviation (Table 1) and the confidence limit (99%) of monthly mean sea surface temperature for 34 stations in the Japan Sea. The results obtained are: 1) the standard deviation of sea surface temperature in the Japan Sea is 1.0°~2.4°C, and its maximum is shown at the latter half of increasing and falling periods of sea surface temperature (June–Aug. and Nov.–Jan.); 2) the standard deviation is large in the area from 38°–41°N of Korea side to 40°–42°N of Japanese side, coast of northern Hokkaidō and off Noto, etc. It may be concluded that there is a line of discontinuity between the cold and the warm current zone, and it is sometimes partially to north or south; 3) the distributions of standard deviation are divided into two main types: a) the standard deviations are large from east to west in the middle Japan Sea, and are small in the northern and southern areas showing in the winter from Dec. to March and b) the standard deviations are large in the neighboring sea of Korea, and are small in the northern part and on the coast of Japan except off the Ōu district from April to Aug. during increasing temperatures. The distribution of standard deviation in falling period of temperature (Sept.–Nov.) is like the latter, but maximum area of it is shown in the sea of northern Korea; 4) the confidence limits of sea surface temperature are shown in a table. *Subject Headings:* **1. Standard deviation of sea water temperatures 2. Japan sea.**—*Author's abstract.*

PRESSURE AND WIND

PRESSURE

See also: **Gradient wind computations** (Silvester), 7.4–83.

7.4–191 551.541 551.543

Pratap, R. (*Geophy. Lab., Bengal Engin. Coll., Howrah*), **The dynamo action of the diurnal atmospheric oscillation.** *Indian Journal of Meteorology and Geophysics*, Delhi, v. 5, Spec. No.:189–194, Dec. **1954.** 3 figs., 10 refs., 13 eqs. **DLC**—Harmonic analysis of the barometric oscillations has shown that the diurnal atmospheric oscillation is very erratic when compared to the regular semidiurnal oscillation. The dynamo equation has been solved here for the diurnal atmospheric oscillation and the H and V variations are evaluated. It is shown here that these variations are insignificant when compared to the variations produced by the dynamo action of the semidiurnal atmospheric oscillation at a height of 100 km. *Subject Headings:* **1. Diurnal atmospheric oscillations 2. Pressure oscillations 3. Harmonic analysis 4. Dynamo action.**—*Author's abstract.*

7.4–192 551.541:623.454.9

Skeib, Günter, **Beobachtungen von Druckwellen bei Wasserstoffbomben-Explosionen im Jahre 1954.** [Observations of pressure waves from hydrogen bomb explosions in 1954.] *Zeitschrift für Meteorologie*, 9(9):280–282, Sept. **1955.** fig., 2 tables, 3 refs. **DLC**—The Bikini explosions of Feb. 28, March 26, April 25 and May 4, 1954 were recorded on barographs at Potsdam, Lindenberg, Wahnsdorf and Collm 11–12 hrs later as pressure waves of 0.1 to 0.2 mmHg amplitude. Barograms are reproduced. The mean velocity of the waves was 288–313 m/s. *Subject Headings:* **1. Pressure waves 2. Atomic explosion effects 3. Bikini H-bomb tests, 1954 4. Germany.**—*C.E.P.B.*

7.4–193 551.543:551.43

Bykov, V. V., **K voprosu o vliianii gor na izmenenie davleniia v sredneĭ troposfere.** [Influence of mountains on pressure changes in the middle troposphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 4:3–12, July/Aug. **1955.** 4 figs., 2 tables, 4 refs., 11 eqs. **DWB**—The problem of the influence of mountains upon pressure changes in the middle troposphere is solved by the method of long waves. Since the vertical motion component of wind velocity can be neglected and the barometric formula can be used from the equation of motion the author develops the following equation for the pressure change at mean level as influenced by mountains:

$$\Delta q = -\frac{\partial \log \eta}{\partial x}\frac{\partial q}{\partial x} - \frac{\partial \log \eta}{\partial y}\frac{\partial q}{\partial y} = F\left(x, y, p, \frac{\partial p_\Sigma}{\partial x}\frac{\partial p_\Sigma}{\partial y}\right).$$

The solution of this equation is demonstrated by the example of the Scandinavian mountains and it is applied to a specific example (AT_{700} of Jan. 2, 1954) as the role of Scandinavian mountains in forecasting the pressure field. *Subject Headings:* **1. Pressure changes 2. Orographic influences 3. Troposphere.**—*I.L.D.*

7.4–194 551.543:551.57

Schumann, T. E. W., **The variations in the total water vapour content of the atmosphere and of global atmospheric pressure.** *South Africa. Weather Bureau, Notos*, 3(3):196–201, **1954.** 6 tables, 7 refs., 27 eqs. **DWB**—In the absence of adequate aerological data from which the standard deviation of average atmospheric pressure might be deduced directly, an attempt has been made to derive this standard deviation indirectly from fluctuations in the mean daily global rainfall. The result arrived at is that the standard deviation of average atmospheric pressure for the world as a whole is less than $\frac{1}{40}$ of a mb, and the expected extreme departure from the mean is less than $\frac{1}{10}$ of a mb. These results apply to short term fluctuations. The difference between the July maximum and Jan. minimum in average atmospheric pressure amounts to $\frac{1}{4}$ of a mb. *Subject Headings:* **1. Standard deviation of pressure 2. Global atmospheric pressure.**—*From author's abstract.*

7.4–195 551.543.1:551.52

Haurwitz, B. (*N. Y. Univ., Dept. of Met. and Oceanog.*), **The thermal influence on the dai pressure wave.** *American Meteorological Society, Bulletin*, 36(7):311–317, Sept. **1955.** 4 figs. 3 tables, 6 refs. **DWB, DLC**—The effect of clear and cloudy days, and of days with large ar small temperature ranges on the daily pressure variation at Bermuda is investigated. It shown that the various harmonic components are not significantly affected by the differe weather conditions contrary to what has been found for continental stations. Such an i dependence from the local weather situation is to be expected over the oceans, especially in t case of the semidiurnal pressure oscillation. The results strengthen the explanation give by CHAPMAN for the occurrence of the semidiurnal pressure maximum two hours before sol transit through the meridian. *Subject Headings:* **1. Diurnal pressure waves 2. Temperatur effects on pressure 3. Bermuda.**—*Author's abstract.*

TURBULENCE

See also: **Gust loads & velocities** (Press et al.), 7.4–207.

7.4–196 551.55

Arakawa, H., **Stabilitäts- und Böigkeits-Bedingungen der allgemeinen Zirkulation d Atmosphäre.** [Condition for stability and turbulent state of the general circulation of t earth's atmosphere.] *Meteorologische Zeitschrift*, Brunswick, 58:381–384, **1941. DLC**– Assuming zonal atmospheric motion, the author obtains the criterion that the zonal motic should be stable if the absolute momentum decreases poleward, i.e., absolute vortici is positive. He also ascertains that the zonal motion should be turbulent if the quanti $V/\cos^2\phi$ (where V is the absolute wind speed, and ϕ the lat.) decreases poleward. The la result might explain clear air turbulence just north of the jet stream. *Subject Heading* **1. Atmospheric turbulence 2. Turbulence theory.**—*W.N.*

7.4–197 551.551:551.513.2:551.5

Clem, LeRoy H., **Clear-air turbulence near the jet-stream maxima.** *American Meteor logical Society, Bulletin*, 36(2):53–60, Feb. **1955.** 13 figs. (incl. photos), 9 refs. **DWB**– The author points out that observational data indicate that most instances of clear air tu bulence are associated with vertical wind shear in and near maximum wind speed cente moving along jet streams. "A physical model is proposed as a possible explanation of cle air turbulence, the associated cirrus bands and wind streaks in the jet maxima. This mod is supported by an anology drawn with similar low-level phenomena studied by WOODCOC and others. The model can explain distribution of these features in the horizontal by mea of helical vortices which are dependent upon proper vertical wind shear and stability cond tions. The observed multiple layers in the vertical are also explained by the model." T occurrence of most clear air turbulence near the jet stream maxima is attributed to the fa that the necessary shear and stability conditions associated with turbulence are most fr quently fulfilled in this region. *Subject Headings:* **1. Clear air turbulence 2. Jet strea models.**—*Based on author's abstract.*

7.4–198 551.551:551.558 551.507:321

*†Erikson, Martin (*Swedish Met. and Hydrol. Inst., Stockholm*), **Study of turbulence an vertical motion in the upper atmosphere derived from the ascensional rates of the rubb balloons.** *Geophysica*, Helsinki, 4(4):153–179, **1954.** 13 figs., 4 tables, 15 refs., eqs. **DWB**– Numerous data on ascension rates of radiosondes are analyzed to remove chance errors an the systematic departures from normal ascension rate examined to determine what effe turbulence has on rate of ascent. Records at Gothenburg Airport 1940–45 show month and height variations, effect of cold and warm air in winter, tropopause effect, relation specific resistance to temperature with height and season, potential temperature and, finall to Richardson number. Results are compared with those of PONCELET at Uccle (1940 *Subject Headings:* **1. Balloon ascension rates 2. Turbulence effects on balloon ascent 3. Got enburg Airport, Sweden.**—*M.R.*

7.4–199 551.551:532.593:551.46

Groen, P., **On the behaviour of gravity waves in a turbulent medium, with application to the decay and apparent period increase of swell.** *Netherlands. Meteorologisch Instituut, Mededeelingen en Verhandelingen, Ser. A*, No. 63, **1954.** 23 p. 16 refs., 41 eqs. Price: f 1.50. **DWB**—With respect to the decay of gravity waves by turbulence, a distinction is made between "internally generated" turbulence, which is generated by the waves themselves, and "externally generated" turbulence, which exists independently of the wave motion. The mechanism of the interaction between "external" turbulence and surface waves is then analyzed and a formula for an eddy viscosity coefficient is derived that shows a dependence of eddy viscosity on the wave-length. On the basis of Richardson's 4/3-power rule for horizontal eddy exchange processes, the decay and apparent period increase of a swell, having a given initial spectral energy distribution, and suffering no loss of energy by dispersion, is investigated theoretically. The results are compared with observations and a numerical formula for the vertically averaged eddy viscosity, operative in the decay of swell, is found by that comparison. *Subject Headings:* **1. Gravity waves 2. Wave mechanics 3. Eddy viscosity in Ocean swell.**—*Author's abstract.*

7.4–200 551.551:628.53:551.510.42

Hawkins, J. E. and Nonhebel, G., **Chimneys and the dispersal of smoke.** *Smokeless Air*, 25:89–91, Winter **1955.** **DWB**—Conclusions of a paper read at Institute of Fuel on Nov. 9, 1955. Chimneys should be at least 2½ times height of adjacent buildings; height and discharge velocity must be sufficient to avoid downdraughts by eddies. These factors and rates of dust deposition can be found by calculation. One high chimney is preferable to several low ones. Washing reduces sulfur concentration over a wide area but leads to occasional puffs of gas at ground level near chimneys. *Subject Heading:* **1. Smoke dispersion.**—*C.E.P.B.*

7.4–201 551.551:551.558.21:532.517.4

Hawthorne, W. R. and Martin, Moira E., **The generation of secondary vorticity in the flow over a hemisphere due to density gradient and shear.** *Great Britain. Aeronautical Research Council. Fluid Motion Sub-Committee, F.M.* 2257, **1955.** 9 p. 8 figs., 5 refs., 11 eqs. Mimeo. **GB-MO**—When an inviscid fluid, with a slight vertical variation of stagnation pressure and density, flows over an obstacle lying on a horizontal plane, a vorticity component in the direction of flow appears. An expression for this secondary vorticity is obtained on the assumption that velocity and density gradients and gravitational effects are small though for the flow to be regarded as a small perturbation of the potential flow about the obstacle. Calculations made for flow over a hemispherical hump show that, if the density is constant and the velocity in the approaching stream increases with height, there is a vorticity component which produces a downward flow on the surface of the obstacle: when the density gradient varies the effect is found to depend on the Richardson number associated with the flow, and for an unstable density gradient, i.e., one in which the density increases with height, which occurs for example in the atmosphere when there is a nonadiabatic lapse rate, the secondary vorticity produced causes an upward flow on the surface of the hemisphere. Experiments with smoke in a low velocity wind tunnel with a heated bottom wall show qualitatively that vorticity components due to both effects may exist together and that their relative importance depends on the sign and magnitude of the Richardson number. *Subject Headings:* **1. Air flow over obstacles 2. Vorticity theory.**—*Authors' abstract.*

7.4–202 551.551:550.38:534

Kulsrud, Russell M. (*Yerkes Observatory*), **Effect of magnetic fields on generation of noise by isotropic turbulence.** *Astrophysical Journal*, Chicago, 121(2):461–480, March **1955.** figs., 2 tables, 11 refs., 83 eqs. **DLC**—LIGHTHILL's (1952) and PROUDMAN's (1952) results on the generation of aerodynamic noise by isotropic turbulence are generalized to include magnetic effects. It is found that if there are only turbulent magnetic fields present and no constant magnetic field, the magnetic turbulence generates sound very efficiently and increases considerably the generation of sound by kinetic turbulence. If there is a constant magnetic field, hydromagnetic waves are generated instead. For the modified sound mode of the hy-

dromagnetic waves, a result similar to the case of no general field is obtained. No energy generated into the Alfvén and modified Alfvén waves unless the energy density of the magnet field is greater than the energy density of the kinetic turbulence. Expressions are found f the rate of noise generated per unit mass, and these results are applied to the problem of heati the chromosphere and the corona. *Subject Headings:* **1. Magnetic field influences 2. Isotrop turbulence 3. Acoustical propagation.**—*Author's abstract.*

7.4–203 551.551:533.

Ogura, Y. and Miyakoda, K. (*both, Geophysical Inst., Tokyo Univ.*), **The structure two- and three-dimensionally isotropic turbulence in the atmosphere.** (In: Conference o Radio Meteorology, Nov. 9–12, 1953, Univ. of Texas, **Supplement to the Proceedings,** IV– pub. **1954.** 8 p. 10 refs., 35 eqs.) **DWB**—One-dimensional turbulence characteristi which could be applied to wind, gustiness, diffusion, etc., were described theoretically b Kolmogorov, Inoue and the authors. The sensitivity of the instruments and the observi procedures determine the accuracy of the calculations. The present paper extends the previo work along these lines to the cases of 2- and 3-dimensional turbulence and to a study of dimensional turbulent diffusion from a point source. The final equation represents t functional form of the Lagrangian correlation in the 3-dimensional case. *Subject Heading* **1. Turbulent diffusion from a point source 2. Polydimensional isotropic turbulence 3. St tistical theory of turbulence.**—*M.R.*

WIND VARIATIONS

See also: **Monsoon distribution** (Schick), 7.4–14.

7.4–204 551.553:519.2(89

Orecchia Buro, Helido, **Modalidad normal horaria de la velocidad del viento en el clim de Montevideo.** [Normal hourly regime of wind velocity in the climate of Montevideo *Revista Meteorológica*, Montevideo, 13(48):4–13, June **1955.** 5 figs., eqs. **MH-BH**—A elementary account of statistical methods—means, standard deviation, coefficient of variatio limits of reliability and standard deviation of grouped observations—is illustrated by figur of hourly velocity of wind in Montevideo. *Subject Headings:* **1. Statistical analysis 2. Wi variations 3. Montevideo, Uruguay.**—*C.E.P.B.*

7.4–205 551.553.12(234.

Thams, J. C. and Zenone, E., **Osservazioni sui venti di monte e di valle nel piano Magadino, Svizzera Sudalpina.** [Observation of mountain and valley winds in the Magadi Plain, southern Swiss Alps.] *Geofisica Pura e Applicata*, Milan, 30(1):185–194, Jan./Ap **1955.** 6 figs., 6 tables, 7 refs. Italian, English and German summaries p. 185. **MH-BH** The phenomenon of the mountain and valley wind has been studied by means of anemogra records on the plain at Magadino (southern Switzerland) during five years. Records ha been evaluated only when there was an anticyclonal situation with fine weather. The vall of the plain of Magadino shows very typical mountain and valley winds and that during t whole year; but they are only of moderate speed. Finally, these wind conditions are compar with those of the neighboring Locarno-Monti, which is situated on a slope. *Subject Heading* **1. Mountain and valley winds 2. Magadino Plain, Swiss Alps.**—*Authors' abstract.*

7.4–206 551.553

*Due Rojo, Antonio (*Dir. Cartuja Obs.*), **El régimen del viento en Granada. II.** [Wi regime at Granada II.] *Revista de Geofísica*, Madrid, 10(40):303–307, Oct./Dec. 195 2 figs., table. **DWB**—Elaborate wind roses and climagrams are presented, with a table a brief text showing frequencies of calms and of winds from 16 points of the compass for peri 1902–1950 at Granada. A similar study for 20 yrs was published in 1930, and little differen is noted between the two periods. Prevailing winds are from W (a mountain wall—t Sierra Nevada—protects Granada in the S to ESE sector) and cold air masses from the N a inhibited by the terrain. *Subject Headings:* **1. Wind regime 2. Wind roses 3. Granad Spain.**—*M.R.*

7.4–207 551.553.6:551.551:629.135.2

Press, Harry; Meadows, May T. and Hadlock, Ivan, **Estimates of probability distribution of root-mean-square gust velocity of atmospheric turbulence from operational gust-load data by random-process theory.** *U. S. NACA. Technical Note*, No. 3362, March **1955.** 48 p. figs., 4 tables, 14 refs., eqs. **DWB**—Relations are derived between the peak gust loads experienced in airplane operations and the probability distribution of root-mean-square gust velocity. These relations are applied in the analysis of operational data on peak gust accelerations to derive estimates of the probability distribution of root-mean-square gust velocity. The application of these results to gust load calculations for other airplane operations is also considered briefly. *Subject Headings:* **1. Gust loads 2. Gust velocities 3. Airplane performance.**—*Authors' abstract.*

7.4–208 551.553.8(54)

*Ramakrishnan, K. P. and Gopinatha Rao, B. (*both, Met. Office, Poona*), **Some broad features of the occurrence of squalls in different parts of India.** *Indian Journal of Meteorology and Geophysics*, Delhi, 5(4):337–340, Oct. **1954.** 4 tables, 5 refs. **DLC**—Data for 5 years (1948–52) on squalls (30 mph or over) for 12 stations in India are tabulated by months and (for various gust-speed groups) by seasons. *Subject Headings:* **1. Squall frequencies 2. Squall characteristics 3. India.**—*M.R.*

SPECIAL WINDS

7.4–209 551.555.3(46)

Miralles, V. G. and Catalá, J., **A Spanish chinook?** *Weather*, 10(12):425, Dec. **1955. DWB**—The local wind observed by N. S. Gardiner (*Weather*, 10(5):173, May **1955**) is common in Spain in summer and is called "ponent." It is warm dry air blowing across the Meseta (1800 ft) warmed still further by descent to sea level. *Subject Headings:* **1. Chinook winds 2. Spain. I. Gardiner, N. S.**—*C.E.P.B.*

7.4–210 551.555.6:551.524.36

*Kibler, C. L. and Martin, R. H. (*both, Nat'l Weather Analysis Center, U. S. W. B., Suitland, Md.*), **Damaging cold wave of March 23–31, 1955.** *Monthly Weather Review*, Wash., D. C., 83(3):78–82, March **1955.** 7 figs., table, 2 refs. **DWB**—Synoptic analysis of situation which obtained before and during cold wave of March 23–31, 1955 in Southeastern States. Warm weather which preceded this cold wave was partly responsible for damage to fruit crop. Thickness (1000–500 mb) was 1400 ft below normal at Edmonton on March 23. On March 25 at Helena, Mont. a temperature of −30°F, the coldest ever recorded in March, occurred. Record breaking minimums were also observed on 26th and 29th at many places in the Plains and Mississippi Valley (10°F at Indianapolis broke March record). Other places listed broke records for so late in spring. Extreme low thickness (1000–500 mb) values are shown in charts for North America. *Subject Headings:* **1. Cold waves 2. Synoptic analysis 3. Record low temperatures 4. Mississippi Valley 5. Southeastern United States.**—*M.R.*

WIND EFFECTS

See also: **Wind action** (Bernard), 7.4–50; **Wind effects on currents** (Bowden), 7.4–51; **Bamboo windbreaks** (Maruyama, Yamamoto), 7.4–56; **Wind damage probabilities,** 7.4–148; **Typhoon damage to rice** (Honda), 7.4–149; **Hurricane "Carol," 1954** (Standard-Times, The Cape Cod Standard-Times), 7.4–158.

7.4–211 551.556.1:634.94

Alexander, Robert R. and Buell, Jesse H., **Determining the direction of destructive winds in a Rocky Mountain timber stand.** *Journal of Forestry*, Wash., D. C., 53(1):19–23, Jan. **1955.** 3 figs., 10 refs. **DWB**—Strip cutting can appreciably reduce blow-down in mountain areas subject to destructive winds, if strips are at right angles to major drainage axes (blow-down was found to be normal to slope in most cases). In central Colorado windfall was found

to be one of the major causes of mortality in the forests. Direction of prevailing winds do not necessarily coincide with direction of destructive winds. Different types of windfall (snags, rotten trees, sound trees with extensive root systems, etc.) differ by only 1° to 5° fro each other—all falling nearly due east on the average. Fall roses resembling wind roses a presented for different types and slopes (varying from 9500 to 11,500 ft in elevation) in th Fraser Colorado Experiment Forest. Method can be used also to determine direction destructive winds. *Subject Headings:* **1. Destructive winds 2. Windfall roses 3. Fore meteorology 4. Fraser, Colo.**—*M.R.*

7.4–212 551.556.

Alisov, B. P., **Metodika i resul'taty mikroklimaticheskikh nabliudeniĭ 1949 g. v pole zashchitnykh polosakh Voronezhskoĭ oblasti.** [Method and results of microclimatic investig tions of 1949 in shelter belt zones of the Voronezh region.] *Voprosy Geografii*, Moscow, N 23:209–217, **1950.** 6 figs. **DLC**—A group of workers of the Scientific Research Institu of Moscow University in the summer of 1949 investigated the changes in wind force, tempera ture and humidity in a separate, single, 12 year old, 6 m high and 15 m wide tree belt and in series of forest belts on adjacent fields. The results showed that the effect of shelter belts o winds begins, in the case of single belts, close to the edge of the belt on the windward side an reaches a maximum on the lee side near the edge. The effect extends to a distance exceedin about 30 times the average height of the trees. It varies depending on wind speed and th density of the belt. When the wind encounters a series of belts a progressive decrease o wind-force takes place. As regards the effect on humidity and temperature, the influenc of separate belts is unimportant; however a zone of raised temperature during the day an of reduced temperature at night is created near the belt. A comparison of the diurnal humidit variation near the belt does not reveal any important differences. *Subject Headings:* **1. Shelte belts 2. Shelter belt effects 3. Voronezh Region, U.S.S.R.**—*A.M.P.*

7.4–213 551.556.2:551.588.

*Matsui, Zenki and Shinohara, Hisao, **On the management of windbreaks in Tokach District.** *Tokyo. Forest Experiment Station, Bulletin*, No. 80:77–99, May **1955.** 12 fig (mostly photos), 23 tables, 8 refs. **DWB**—Nine line windbreaks planted since 1932 prove effective as sources of wood in 20 or 30 yrs as well as in protecting crops. Larch was mor effective since it was leafed out over a longer season than oak. *Subject Headings:* **1. Wind break effectiveness 2. Forest influences 3. Tokachi District, Japan.**—*M.R.*

7.4–214 551.556.2:551.588.

§*Onodera, Shigeru; Masuda, Hisao and Ishikawa, Mawayuki, **On the effects of the wind break.** *Tokyo. Forest Experiment Station, Bulletin*, No. 80:53–76, May **1955.** 16+9 figs 2 plates, 13 tables, 12 refs. In Japanese; English summary p. 74. **DWB**—A remarkabl thorough study of observations made at different heights and distances behind windbreaks a Nakasatsunai in the Tokachi District from 1951 to 1953. Anemographs, standard 3-cu anemometers and small anemometers were installed at different distances behind wind break of various types (oak and larch). It was found that wind speed was 40% less just behind an 70% less at 3 to 5 times the height (H 12 m) of the stand. Some decrease was found up t 13 to 15 H. When wind blows at an oblique angle, the wind penetrates the stand at righ angles but becomes the same as the prevailing wind at about 10 H. At 3–5 H the wind is a a minimum due to wind coming directly over the stand, mixing with wind penetrating at righ angles to the stand. Larch gives 25% less reduction than oak. *Subject Headings:* **1. Wind break effectiveness 2. Forest influences 3. Tokachi District, Japan.**—*M.R.*

7.4–215 551.556.2:533.60

Tani, Nobuteru (*Nat. Inst. of Agr. Sci., Div. of Met.*), **On the mechanism and effec of shelter-hedge (Wind tunnel test of the model hedge, Pt. 3).** *Journal of Agricultura Meteorology*, Tokyo, 9(2):63–65, March **1954.** In Japanese; English summary p. 65. fig table, eqs. **DWB**—"The horizontal distribution of wind velocity behind the model hedge

et on a flat plate at right angles to the wind tunnel flow, was measured by means of 7 Pitot ubes and inclined anemometers." The model hedges had a height of 9 cm and a length of 80 cm. The drag coefficient was calculated from velocity loss in the wakes and the relation etween drag coefficient and screen ratio was shown to be linear. (For Pts. 1 & 2, *see* 5.10–162, ct. 1954, *MAB.*) *Subject Headings:* **1. Windbreak effectiveness 2. Wind tunnel experiments.**—*I.L.D.*

UPPER AIR WINDS

See also: **West-wind component chart** (Martin, Anderson), 7.4-81; **Wind forecasts** (Rutherford), 7.4–82; **Gradient wind computations** (Silvester), 7.4–83; **Winds in tropics & subtropics** (Gilchrist), 7.4–141; **Jet stream profile** (Rutherford), 7.4–143; **Jet stream study** (Dickson), 7.4–144; **Jet stream navigation aspects** (Jacobs), 7.4–145; **Clear-air turbulence** (Clem), 7.4–197.

7.4–216 551.557:551.510.535:551.501.8

Court, G. W. G., **Ionospheric wind determination from spaced radio receiver fading records.** *Journal of Atmospheric and Terrestrial Physics*, 7(6):333–340, Dec. **1955.** 11 figs., refs. **DWB**—A method of determining winds is described using a fixed aerial and one moving n a circular path round it. The wind direction is given by the line of the aerials when optimum orrespondence of records is obtained, and the time delay indicates the velocity. *Subject Heading:* **1. Ionospheric wind measurement.**—*C.E.P.B.*

7.4–217 551.557:551.513.2

Highest wind measured at close to 300 mph. *Science News Letter*, Wash., D. C., 67(13): 00, March 26, **1955. DLC**—A brief note on the approximately 300 mph wind sweeping over Philadelphia at an altitude of 20,000 ft on Jan. 23, 1955. It was part of the 300 mi wide jet tream at about 30,000 ft. The exact figure of the measurement is still argued. *Subject Headings:* **1. Jet stream speed 2. Wind velocity.**—*W.N.*

7.4–218 551.557.3(748)

Ratner, Benjamin (*U. S. W. B., Climat. Serv. Div.*), **The high wind over Philadelphia, Pa., January 23, 1955.** *Monthly Weather Review*, 83(1):31, Jan. **1955.** table, ref. **DWB**—eletype report from Philadelphia on Jan. 23, 1955, indicating winds of 396 kn at 23,000 ft for 500 GMT was widely advertised in the news. Thorough check indicates data after 11th inute (13,000 ft) of sounding is unreliable due to mechanical failure of rawin recorder equipent. Space-time analysis indicates winds about 200 kn at 23,000 ft and perhaps 265 kn t 32,000 ft. Data for 03, 09, 15, 21 and 0300 h GMT on Jan. 23 and 24 at Washington, Philadelphia and Hempstead show pattern of winds aloft. *Subject Headings:* **1. Upper air wind extremes 2. Jet stream winds 3. Rawin errors 4. Philadelphia, Pa.**—*M.R.*

VERTICAL MOTION

See also: **Turbulence effects on balloon ascents** (Erikson), 7.4-198; **Vorticity theory** (Hawthorne, Martin), 7.4–201.

7.4–219 551.558.21:551.576.1:551.588.7

Stranz, Dietrich, **Study of impressive wave formation in the atmosphere.** *Göteborg, Sweden. Chalmers Tekniska Högskola, Handlingar*, No. 71, **1948.** 7 p. figs., table, 2 refs., qs. *Reports from the Research Laboratory of Electronics*, No. 5. **DWB**—Local industrial eat is assumed to have initiated an oscillation on a boundary layer at 2500 m which resulted n a series of wave clouds seen to the west of Collmberg Observatory, Leipzig. The amplitude f the wave formation (500 m) is considered to be high compared with wave length of 800–000 m. The upper air (radiosonde and pilot) observations at Erfurt and Berlin, respectively, re given in adiabatic charts and an aerological-dynamical analysis of conditions from 980 to 10 mb included. *Subject Headings:* **1. Industrial heat effects 2. Wave clouds 3. Collmberg Observatory, Leipzig.**—*M.R.*

AQUEOUS VAPOR, HYDROMETEORS AND HYDROMETEOROLOGY

HUMIDITY

See also: **Water vapour content and pressure** (Schumann), 7.4–194.

7.4–220 551.571:620.19:551.510.4

Ambler, H. R., **Humidity and corrosion.** *Nature*, London, 176(4492):1082, Dec. 3, 1955 table. **DWB**—Observations of corrosion of mild steel in high humidity (78–95%) in Nigeri gave 5.6 gm/dm²/month on the beach (sodium chloride deposited on damp surface 800 mgm m²/day) to 0.10 in a jungle clearing 30 mi inland (sodium chloride deposit 7.5 mgm). *Subjec Headings:* **1. Corrosion 2. Salinity effects.**—*C.E.P.B.*

7.4–221 551.571:537.22

Saito, Shigebumi (*Tokyo Univ., Chiba-City, Japan*), **Measurement of 9,000 Mc. of th dielectric constant of air containing various quantities of water vapor.** *Institute of Radi Engineers, N. Y., Proceedings*, 43(8):1009, Aug. **1955.** 3 figs., 5 refs., eq. **DLC**—Using klystron oscillator, the humidities (or dielectric constant) of dry air and air of various hu midities were measured and the relations between frequency difference (at 9000 Mc) an vapor pressure at various temperatures shown to follow closely an empirically derived formul and to lend itself to straight line curves. The measuring equipment is shown also to be stabl over several days (i.e., very little drift was noted in resulting frequency curves). *Subjec Headings:* **1. Humidity measurements 2. Klystron oscillator 3. Dielectric constants.**—*M.F*

EVAPORATION

See also: **Lake fluctuations** (Royal Geog. Soc. of Australasia), 7.4–4; **Glaciological observations** (Bergström), 7.4–67; **Glaciological observations** (Ives, King), 7.4–69.

7.4–222 551.57

Ivanov, L. A.; Silina, A. A.; Zhmur, D. G. and Tselniker, IU.L., **Ob opredelenii trans piratsionnogo raskhoda drevostoem lesa.** [On the determination of transpiration by forest stand.] *Botanicheskiĭ Zhurnal*, Moscow, 36(1):5–20, **1951.** 11 tables, refs. **DLC**— Method of quick weighing of tree leaves tested and applied for a region near Moscow. Tran spiration intensity of 17 tree species was determined in more than 6000 cases. Statistica tabulation of observational materials shows that during the growing season good relatio exists between the air temperature and the transpiration intensity. Correlation coefficient were 0.65–0.95. Transpiration rates at sufficient moisture supply are presented for eac species, arranged by temperatures from 4° to 29°C. *Subject Heading:* **1. Transpiration o forests.**—*N. T. Zikeev.*

7.4–223 551.573:551.588.

†Ivanov, L. A., **Otnoshenie k vlage drevesnykh porod, primeniaemykh pri stepnom leso razvedenii.** [Relationship of types of forest trees to the moisture used in afforestation o steppes.] *Akademiia Nauk SSSR. Institut Lesa, Nauchnye Voprosy Polezashchitnog Lesorazvedeniia*, No. 1:109–124, **1951.** 5 tables, bibliog. p. 123–124. **DLC**—Attempt at literature review for the years 1890–1940 on transpiration of a great many kinds of trees an shrubs listing 25 Russian papers, and but one obsolete foreign source. Some of these paper deal with the influence of meteorological conditions and soil moisture on transpiration. *Subjec Headings:* **1. Transpiration 2. Soil moisture 3. Forest influences.**—*A.A.*

7.4–224 551.573(676

*Sansom, H. W., **Measurement of evaporation in East Africa.** *East Africa High Com mission. Meteorological Dept., Technical Memorandum*, No. 5, **1953?** 7 p. 3 tables, 10 refs **DWB**—Evaporation measurements are made with a Piché evaporimeter in East Africa, an with an evaporation pan in Kenya. Data from pans and from the Piché evaporimeter ar compared for stations in the region at different elevations from Mombasa (200 ft elev.) t

ldoret (7050 ft) and at equator (9060 ft). Monthly values at equator from Jan. 1949 to)ec. 1951 inclusive show an average of 4.05 for the Piché and 5.01 for the pan, though in some lonths the Piché exceeded the pan. *Subject Headings:* **1. Evaporation measurements 2. Piché vaporimeter 3. East Africa 4. Kenya.**—*M.R.*

CONDENSATION NUCLEI

See: **Weather effects on aircraft design** (Rendel), 7.4–54; **Engineering reports** (Aeron. Ice Res. Lab., Minneapolis, Minn.), 7.4–105; **Condensation nuclei counter** (Holl, Mühleisen), 7.4–112.

FOG AND CLOUD

See also: **Drop size distrib. measurem.** (MIT. Dept. of Met.), 7.5–106; **Wave formation in atmos.** (Stranz), 7.4–219.

7.4–225 551.575.1

Ohta, S., **On the dry and wet fog and size of their drops.** *Meteorological Society of Japan, Journal*, Ser. 2, 24(1/2):21–23, **1946.** 2 figs. In Japanese; English summary p. 36. **DLC**—Types of fog were classified as dry, wet and medium, according to the wetness of the fog. The mutual relation between these types, drop size and wind velocity was studied. The results are as follows: (1) The drops are larger in wet fog than in dry fogs, and the critical radius between these types seems to be 10–12μ, (2) Wind velocity has some effects on these types; av^2, the product of the square of wind velocity v and the radius of drops a seems to be the principal factor deciding the type of fog. *Subject Headings:* **1. Fog classification 2. Fog drop size.**—*Author's abstract.*

7.4–226 551.576.32

Ekhart, E. (*Salzburg*), **Der Jahresgang der Bewolkung in weltweiter Darstellung.** [World wide presentation of the annual variations of cloudiness.] *Berlin. Freie Universität. Institut für Meteorologie und Geophysik, Meteorologische Abhandlungen*, 2(4):39–52, **1955.** 6 figs., table, 4 refs. **DWB**—The method used by the author to study the annual and semi-annual components of the cloud regime over the Alps is extended to cover the cloud regime or regimes of the whole earth (where only uneven and nonhomogeneous records are available). The variations in magnitude of error are considered quantitatively and Fourier analysis used to establish the annual and semiannual cycles. Charts of the earth show vector lines of phase and scalar amplitude values obtained thereby. The dependence of the one and the one-half-year components of cloudiness on latitude and month for Northern and Southern Hemisphere is shown on polar coordinate charts (periodograms). *Subject Headings:* **1. World cloudiness 2. Annual cloudiness variations 3. Cloudiness.**—*M.R.*

PRECIPITATION

See also: **Lake fluctuations** (Royal Geog. Soc. of Australasia), 7.4–4; **Obs. methods of showers & thunderstorms** (Muchnik), 7.4–76; **Rainfall statistics** (Schneider-Carius), 7.4–77; **Rainfall measurem. variation** (Watkins), 7.4–87; **Rainfall statistics** (S. Africa. Weather Bur.), 7.4–97; **Hurricane "Diane," 1955** (U.S.W.B.), 7.4–161; **Recurrence-surfaces** (Godwin), 7.4–258; **Meteor dust causes rain,** 7.4–281.

7.4–227 551.577

*Austria. Hydrographisches Zentralbüro, **Die Niederschläge in Österreich im Zeitraum 1901–1950.** [Rainfall in Austria, 1901–1950.] Its *Beiträge zur Hydrographie Österreichs*, No. 27, pub. Vienna, **1953.** 268 p. almost entirely tables. map fold. in pocket. **DWB**—Extensive tables of monthly precipitation since 1901 in the Rhine, Inn, Danube, Mur and Raab (Raba) and Dran (Drave) basins of Austria (1415 stations). Normals based on 1901–1950 data are used to construct the enormous (1:500,000) colored wall chart giving annual isohyets throughout Austria. *Subject Headings:* **1. Precipitation data for Austria 2. Precipitation normals 3. Isohyetal charts 4. Austria.**—*M.R.*

7.4–228 551.577:551.585(81)

Magnanini, Alceo, **As regiões naturais do Amapá.** [Natural regions of Amapá.] *Revista Brasileira de Geografia*, Rio de Janeiro, 14(3):243–304, July/Sept. **1952.** 37 figs., tables, foot refs. French, English, Spanish, German and Esperanto summaries p. 299–304. **DWB**— The climate (especially precipitation) of the region of Amapá is discussed on p. 249–252 with graphs of normal monthly precipitation for 4 stations (p. 249), climatic table (p. 250) and an isohyetal chart (p. 252) with respect to topography, indicating a vast region of <3000 and even <2000 mm annual rainfall which is in keeping with savannah landscape, but which does not conform with existing isohyetal or classification charts (KÖPPEN or THORNTHWAITE). Effects of climate (temperature and rainfall, floods, etc.) on soils, geomorphology, agriculture and human activity are considered throughout this long article. *Subject Headings:* **1. Climate of Amapá, Brazil. 2. Climatic regions 3. Amapá Region, Brazil.**—*M.R.*

7.4–229 551.577:551.588.2:519.24(54)

Schneider-Carius, K. and Essenwanger, O. (*both, Deutscher Wetterdienst, Bad Kissingen*) **Analyse von Niederschlagswahrscheinlichkeiten ausgewählter Stationen Vorderindiens** [Analysis of precipitation probabilities at selected Indian stations.] *Geofisica Pura e Applicata*, Milan, 30(1):205–221, Jan./April **1955.** 8 figs., 3+tables, 11 refs. German and English summaries p. 205. **DWB**—For interpretation of precipitation, mean totals and frequency of precipitation-amounts for the investigating period are considered. Up to now the experiments to get a meteorologically valid probability for this frequency were unsuccessful because the internal law of atmospheric conditions was not considered. From statistical investigations, applied to observations of precipitation for some German stations, it could be concluded that there is a logarithmic law for characterizing conditions of precipitation. Therefore on a logarithmic scale we get a real meteorological probability for the frequency of precipitation-amounts. Then the distribution consists of one Gaussian normal distribution or a sum of Gaussian normal distributions. The validity of this logarithmic law can be proved by examples from extreme climates such as Cherrapunji, Karachi, Madras and Quetta. *Subject Headings:* **1. Statistical studies 2. Precipitation variations 3. India.**—*Authors' abstract.*

7.4–230 551.577.11

Fournier d'Albe, E. M. and Hidayetulla, M. S., **The break-up of large water drops falling at terminal velocity in free air.** *Royal Meteorological Society, Quarterly Journal*, 81(350):610–613, Oct. **1955.** 2 figs., 5 refs. **DWB**—Fragments from break-up of large single drops falling from a height of 20 m at Quetta were caught on blotting paper and measured. Drops $8\frac{1}{2}$–$12\frac{1}{2}$ mm diameter broke into 3–97 fragments, mostly 1–3 mm diameter. *Subject Heading:* **1. Raindrop breakup.**—*C.E.P.B.*

7.4–231 551.577.11:551.511

Miller, James E., **Intensification of precipitation by differential advection.** *Journal of Meteorology*, 12(5):472–477, Oct. **1955.** fig., 4 tables, 7 refs., 9 eqs. **DWB**—The effect of vertical instability on the intensity of precipitation is illustrated by a theoretical example. This example and others from the literature lead to the hypothesis that instability produced by a process such as advection of cold air over warm, moist air acts on a precipitation system to increase the total amount and to cause high intensities for short periods over small areas. The latter part of the hypothesis is verified by an analysis of 21 rainy periods in the eastern United States. *Subject Headings:* **1. Precipitation mechanism 2. Advection.**—*Author's abstract.*

7.4–232 551.577.2:551.579:628.13(46)

Thon, Joachim (*Stuttgart, Germany*), **Die Bewässerung in Spanien.** [Irrigation in Spain.] *Wasserwirtschaft*, Stuttgart, 45(4):85–90, Jan. **1955.** 16 figs. (incl. photos), table. **DLC**— A general description of the climate of Spain, in particular the precipitation distribution, is presented and a map showing mean annual precipitation is shown. The river regime, the extent of irrigation and of water storage, the magnitude of the irrigation canals, etc. are discussed and illustrated with photographs. *Subject Headings:* **1. Rainfall 2. Water conservation. 3. Spain.**—*I.L.D.*

7.4–233 551.577:551.589.1(82)

§Wolcken, Kurt, **Algunos aspectos sinópticos de la lluvia en la Argentina.** [Some synoptic aspects of rain in Argentina.] *Meteoros*, Buenos Aires, 4(4):327–366, Oct./Dec. **1954.** 11 maps, 10 tables, 14 refs. Spanish and English summaries p. 327. **DWB.** Also issued as *Argentina. Servicio Meteorológico Nacional, Serie Meteorológica, Publicacion* No. 28, **1954.**—This study begins with a description of the precipitation, water vapor and mean temperature and pressure distribution over South America, the Jan. and July and annual distribution of these elements being illustrated by means of isolines. This is followed by a synoptic analysis of the precipitation of Argentina in 1941 and 1942 for Tucuman, Corrientes, Mendoza, Buenos Aires and Santa Rosa (Patagonia being excluded). Tables show quantitatively the role of each of those processes in the formation of rainfall. Also maximum daily rainfall for these areas and the ten extreme cases for each place are analyzed synoptically. *Subject Headings:* **1. Synoptic analysis 2. Rainfall distribution 3. Climate of South America 4. Argentina.** —*I.L.D.*

7.4–234 551.577.33:551.509.67

*Brier, Glenn W. (*U. S. W. B., Wash., D. C.*), **Seven-day periodicities in certain meteorological parameters during the period 1899–1951.** *American Meteorological Society, Bulletin*, 36(6):265–277, June **1955.** 16 figs., 10 tables, 6 refs., eqs. **DLC, DWB**—The author examines the nature of the evidence upon which is based the claim of Irving Langmuir that the silver iodide ground generator operated by Project Cirrus introduced a 7-day periodicity into rainfall. The natural frequency of 7-day cycles in rainfall, in sea level pressure across the northern Gulf of Mexico and in the 700 mb temperature and pressure is examined. A sinusoidal wave with four complete cycles was fitted to observation for 28-day periods of the seeding period, the coefficient of correlation between the observed and computed wave were calculated and the magnitude of the 7-day cycle was measured by determining the amplitude of the fitted curve. These values during the seeding periods were compared with similar values calculated from the pressure difference data for 600 mo of the period 1899–1949. Also the day on which the curve attains a maximum was determined. Similar techniques were applied to the other above mentioned elements. *Subject Headings:* **1. Rainfall periodicities 2. Cloud seeding.** —*I.L.D.*

7.4–235 551.577.37(234.3)

Ambrosetti, Flavio (*Central Met. Service, Locarno-Monti*), **Precipitazioni intense al margine meridionale delle Alpi.** [Intense precipitation on the south side of the Alps.] *Geofisica Pura e Applicata*, Milan, 30(1):222–236, Jan./April **1955.** 10 tables, 20 refs. Italian, English and German summaries p. 222. **DWB**—In the present paper the frequency of heavy precipitation (daily amounts ≥ 50 mm) on the southern slope of the Swiss Alps (period 1901–1950) is examined. For this purpose the conditions of precipitation of six stations in southern Switzerland are compared with those of one station on the northern slope of the Alps (Zurich) and of one in Lombardy (Milan). It is shown that the frequency of heavy precipitation is much higher on the southern slope of the Alps than on the stations mentioned in comparison. Also that the amount of heavy precipitation in the total amount is considerable. *Subject Headings:* **1. Excessive precipitation 2. Alps.**—*Author's abstract.*

RAIN AND SNOW

See also: **Winter precip. obs. analysis** (Wilson), 7.4–88; **Snowstorms in spring** (Booth), 7.4–183.

7.4–236 551.578.1:551.594.14

Rain three weeks old. *Science News Letter*, 66(13):197, Sept. 25, **1954. DLC**—The measurement of tritium radioactivity (half time—12.5 yrs) makes it possible to measure the age of the water due to its contact with higher atmospheric layers, where tritium is formed by the action of cosmic rays. Rain on the average has three week "old" water, deep water wells produce 50 year old water. Rain water mixes with ocean water up to 150 ft. *Subject Headings:* **1. Tritium measurement 2. Radioactivity of rain. I. Libby, W. F.**—*A.A.*

7.4–237 551.578.11:634.94

Will, G. M., **Removal of mineral nutrients from tree crowns by rain.** *Nature*, London, 176(4494):1180, Dec. 17, **1955.** table, 2 refs. **DWB**—Rain water beneath trees contained a much larger content of salts than rain in the open, and is an important source of nutrients. *Subject Heading:* **1. Rain composition beneath trees.**—*C.E.P.B.*

7.4–238 551.578.41

Imai, Ichiro, **On the incipient stages of snow crystals.** *Seppyo* (*Snow and Ice*), Tokyo, 11(4):123–131, **1949.** figs., tables, foot-refs. In Japanese; English summary p. 5. **DWB**—Supercooled waterclouds often contain minute snow crystals, 10∼100μ in size, which are considered to be the incipient stages of crystal growth. The author collected about 200 photomicrographs of such crystals at the observatories of Mt. Fuji (3776) and Mt. Ibuki (1370), and investigated the relation between their crystal forms and the air temperatures at the time when observed. The columnar forms were always observed at temperatures above −10°C, and the tabular forms below −9°C. The observed temperature ranges of various crystal forms are shown in a table. These results are nearly consistent with the case of artificial snow. The author concludes that all snow crystals are, at the first stage of its formation, perfect crystals of about 10μ in size, which undergo different skeletal growth corresponding to the temperature, i.e., in the direction of the principal axis above −10°C, and in the directions of secondary axes below −10°C. The temperature range of the most rapid growth parallel to the secondary axes is −12.5∼−15°C, which is by 1∼2°C higher than that of dendritic artificial snow. *Subject Headings:* **1. Snow crystal growth 2. Snow crystal forms 3. Mt. Fuji, Japan 4. Mt. Ibuki, Japan.**—*Author's abstract.*

7.4–239 551.578.41:551.579.4

Lewińska, Janina, **Badania zawartości wody w śniegu na tle wezbań wiosennych.** [The study of water content of snow and spring floods.] *Przeglad Meteorologiczny i Hydrologiczny*, Warsaw, 6(3/4):83–94, **1953.** fig., table, 20 refs. English summary p. 94. **DWB**—The thickness of snow cover, its content in accumulated water, the changes of weather conditions (mainly air temperature changes) and retention properties of the ground are the main factors determining spring floods. An analysis of results of such observations carried out by the author in order to study the mechanism of spring floods in the region of the Carpathian Mountains during 5 winter periods (1948/49–1952/53) are presented in graphs (variation of water content in snow cover and its relationship with air temperature) and tables and discussed. It was shown that of the 5 investigated periods, two (1948/49, 1951/52) were abundant in snow; two (1950/51, 1952/53) were normal and the remaining were poor in snow. The highest snow retention, 547 million m³, occurred in 1951/52 (90% of the annual runoff) while the mean for the 5 yrs was 230 mil. m³ or 42% for the mean yearly runoff. In spite of the brevity of the observations, a certain rhythm of sequence of winters rich and poor in snow may be observed. A tendency to floods in the following spring and summer is noticeable after a winter with abundant snowfalls when great quantities of water are stored in snow cover. This may be considered as an indication of coming floods. *Subject Headings:* **1. Water content of snow 2. Spring floods 3. Snow melt runoff 4. Poland.**—*A.M.P.*

7.4–240 551.578.45

§Kikuchi, Tetsuo, **On snowstorm types in Iwate Prefecture.** *Iwate Meteorological Equality Corresponding Association, The Review*, Nov. **1951,** p. 1–7. figs. In Japanese; English summary, abstract section, p. 1. **DWB**—Fifteen instances of heavy snowfall in Iwate Province in 25 years (1923–47) are classified according to 2 types—the inland type and the mountain type, and according to another criteria—the warm front and the cold front type. Charts show the areas and amounts of snowfall for types shown by synoptic charts. *Subject Headings:* **1. Snowstorm types 2. Iwate Prefecture, Japan.**—*M.R.*

7.4–241 551.578.46:551.588.2

*Dona', Ferdinando, **Programma di studie e nota preliminare sulla distribuzione altimetrica del manto nevoso e delle precipitazioni nevose nella regione Veneta.** [Program of study and preliminary note on the altitudinal distribution of snow cover and of snow precipitation in the

Veneta region.] *Congresso Geografico Italiano, 15th, Turin, April 1950, Atti*, p. 244–252, pub. 1952. 5 tables, 2 figs., 11 refs. **DWB**—A study of the variation of snow cover depth, gradient of depth, and duration with height and locality based on 22 years of record for 236 stations in the basins of Veneto and Medio Adige (Agno-Guà, Astico, Brenta and Piave—100 to 2600 m elev.). Only 11% of the stations are above 1500 m. Data are presented in tables and graphs and analyzed. At 1800–2000 m there is a marked increase in the "gradient" of snow depth. A contrary decrease in snow cover occurs at 900–1100 m and may be due to the "peplopause" or inversion, or possibly to accidental causes. *Subject Headings:* **1. Snow cover gradient 2. Altitude effects on snow cover 3. Veneto Basins, Italy.**—*M.R.*

7.4–242 551.578.46:621.311.21

Hori, Sadaji, **Relations between snow research and electric power development.** *Researches on Snow and Ice*, Tokyo, No. 1:1–6, Nov. 1953. 3 figs. In Japanese. **DWB**—From the Japanese hydroelectric point of view, the validity of snow cover and the damage due to snowfall are discussed. This note was written as the introductory preface to these collective papers. *Subject Headings:* **1. Hydroelectric power 2. Snow accumulation on wires.**—*H. Arakawa.*

7.4–243 551.578.46:551.588.6

Kataoka, Kenjiro, **Depths of snow cover according to several types of forest, Pt. 3.** *Seppyo* [*Snow and Ice*], Tokyo, 12(5):176–179, 1951. diagrs., tables. In Japanese. **DWB**—Depth of snow cover in a forest vs. depth of snow cover over a bare plain has a proper straight line relationship, which is uniquely determined by the types of forest (variety, or species and age). *Subject Headings:* **1. Snow accumulation 2. Forest influences.**—*H. Arakawa.*

HYDROMETEOROLOGY

See also: **Lake fluctuations** (Royal Geog. Soc. of Australasia), 7.4–4; **Hydrolog. bibliog. Hungary** (I.U.G.G.), 7.4–40; **Soil-moisture instruments** (Stanhill, Winter), 7.4–107; **Hurricane "Diane," 1955** (U. S. W. B.), 7.4–161; **Irrigation in Spain** (Thon), 7.4–232; **Water content of snow & spring water** (Lewińska), 7.4–239.

7.4–244 551.579.2(438)

Parczewski, Władysław, **Przyczyny powodzi roztopowej na małych ciekach nizinnych w zimie 1953 r.** [The causes of the thaw flood on little lowland streams in the winter of 1953.] *Przegląd Meteorologiczny i Hydrologiczny*, Warsaw, 6(3/4):18–34, 1953. pub. 1954. 13 figs., 3 tables, 3 refs. English summary p. 34. **DWB**—Results of a study of the causes and development of the unusual flood which occurred at the end of Jan. 1953 in Poland which began in the form of small streams in the lowlands of the Ochnia, Bzura and other river basins. A survey of the atmospheric situation development shows that the causes of the phenomenon were: 1. the passage over Poland of an extended low pressure area with intrusion of warm maritime Polar air masses along the frontal surface, causing heavy precipitation; 2. intensive melting of the snow cover caused by the sudden thaw, strong gusty winds and high relative humidity hindering evaporation, as well as rains; 3. the high value of the runoff coefficient due to ice crust in the bottom layer of the snow surface which resulted from alternating thaw and frost periods. The analysis shows that intensive condensation of water vapor is not sufficient to start floods of small lowland streams in winter; and that floods must be favored by conditions propitious to the melting of snow and the run off of the snow water. The development of such situations can be forecast by a study of thermal and dynamic changes in low pressure areas approaching the country, and of the snow cover. Numerous weather charts, graphs and tables illustrate the paper. *Subject Headings:* **1. Floods, Poland (1953) 2. Flood analysis 3. Flood forecasting 4. Poland.**—*A.M.P.*

7.4–245 551.579.4(438)

Born, Artur, **Powodzie na Odrze środkowej w XX wieku.** [Floods on the Oder River in the 20th century.] *Przegląd Meteorologiczny i Hydrologiczny*, Warsaw, 6(3/4):9–11, 1953. pub. 1954. **DWB**—Hydrologic surveys of possible floods of the Oder River are based on

water gage measurements at main checking points below the inflows of the most important affluents, at: Racibórz (50.2 km), Scinava (332 km), Nowa Sól (429.8 km), Potęcko (530.6 km) and Stubice (584 km). An analysis of the course of floods during the present century and of the part played by the main tributaries shows that the possibility of catastrophic floods is small. This belief is supported by the presence of a series of reservoirs which decrease or even eliminate the danger completely. Floods caused by ice blocking happen in March or even in Feb.; however, recent regulations of the river bed have diminished the danger. In general, the climatic conditions do not favor the occurrence of heavy rains in summer simultaneously in large areas, and spring snow melting in the lower part of the basin takes place, as a rule, earlier than in the upper part, and the culmination points of the Oder spring surges, coming from upstream, do not catch up with the highest levels of river flow in the middle and lower course of the river. *Subject Headings:* **1. Flood analysis 2. Oder River.**—*A.M.P.*

7.4–246 551.579.4:625.1:627.51

Izzard, Carl F., **Peak discharge for highway drainage design.** *American Society of Civil Engineers, Transactions*, 119:1005–1024, **1954.** 6 figs., 13 refs. p. 1016–1024, Kohler, Max A.; Warner, Roy F.; Minshall, N. E. and Izzard, Carl F., **Discussion.** 2 tables, refs., 14–27. **DLC.** Also issued as its *Paper*, No. 2708. Original paper also issued as its *Proceedings, Separate*, No. 320. **Discussion** issued as its *Proceedings*, v. 81, *Separate*, No. 598, **1955.** **DWB**—In the original paper stream flow records are used to calculate regional flood frequency curves which can be applied to estimation of peak flood runoff rates for highway drainage construction. Examples from Kansas records are used and graphs, curves, etc. presented to illustrate method. Small watersheds (<1000 acres) require adjustments. A large mass of data has been analyzed. KOHLER elaborates on use of U. S. W. B. flood forecasting techniques suggested by IZZARD as an improvement over use of runoff data. Maximum rainfall curves provide as good an estimate as runoff data extrapolated from one region to another, even or especially when <10 years of data are available. MINSHALL discusses effect of cover type. *Subject Headings:* **1. Flood frequency curves 2. Highway drainage design 3. Precipitation–runoff relationships 4. Stream flow analysis.**—*M.R.*

7.4–247 551.579.4(794)

*U. S. Geological Survey, **Floods of November–December 1950 in the Central Valley Basin, California.** Its *Water-Supply Paper*, 1137-F, **1953.** 789 p. 94 figs. (incl. photos), 6 maps (fold. in pocket), numerous tables, refs. **DWB**—This report describes the 1950 flood and gives "details and estimates of the damage incurred, records of stage and discharge for the period of the flood at 171 stream gaging stations, records of storage in 14 reservoirs, a summary of peak discharges with comparative data for previous floods at 252 measurement points, and tables showing stages along the main stem and major tributary channel of the Sacramento and San Joaquin Rivers." In addition, this report contains a discussion "of meteorologic and hydrologic conditions associated with the flood, examples of flood regulation afforded by storage reservoirs, a brief study of runoff characteristics, and a summary and comparison with previous floods of the Central Valley Basin." Photographs of the flood damage, a map showing the location of flood determination points, isohyetal map of five storms Nov. 9, 13–15 and 16–21 and Dec. 2–4 and 6–8, 1950, and an isohyetal map showing local precipitation for Nov. 13–Dec. 8 for Central Valley Basin are included. *Subject Headings:* **1. Floods 2. Flood damage 3. Central Valley Basin, Calif.**—*I.L.D.*

7.4–248 551.579.4:629.12

U. S. Lake Survey (Corps of Engineers), **Variations in Great Lakes levels.** Feb. **1952.** 33 p. 4 figs. (fold.), 3 tables. **DWB**—The water level on the Great Lakes varies with individual storms, changes in wind or pressure, seasons and from year to year. Extreme variations are of the order of 6 to 10 ft but every inch affects the potential carrying capacity of each ship to the extent of 100 tons per trip, and running into over a million dollars worth of business in a season. The natural factors affecting seasonal water level are precipitation, evaporation, flow of rivers and crustal movements of the earth. Long range forecasts have not hitherto been made, but would be extremely valuable if accurate. Charts show variations in levels of all lakes from 1860–1952. Water levels were higher in 1951 than any year since 1919,

nd were exceeded only a few times before. *Subject Headings:* **1. Water levels in Great Lakes 2. Lake level variations 3. Shipping 4. Great Lakes.**—*M.R.*

7.4–249 551.579.5:536.37

Hadley, William A. and Eisenstadt, Raymond, **Thermally actuated moisture migration in granular media.** *American Geophysical Union, Transactions*, 36(4):615–623, Aug. **1955.** 7 figs. (incl. photos), 7 refs. **DWB**—The movement of moisture in granular media with varying temperature gradients was studied by means of radioactive tracers in a laboratory. The mode of moisture movement is controlled by a critical moisture content found theoretically and experimentally to be about four percent. *Subject Headings:* **1. Percolation 2. Heat effects on moist substances.**—*Authors' abstract.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

See also: **Climatology & long-range forecasting** (Lawrence), 7.4–121.

7.4–250 551.58:378:551.4

Bryan, Kirk (*Harvard Univ.*), **Place of geomorphology in the geographic sciences.** *Association of American Geographers, Annals*, 40(3):196–208, Sept. **1950.** bibliog. p. 206–208. p. 202: **Climate and geomorphology. DLC.** Translation by Cecilia Zarur into Portuguese as: **O lugar da geomorfologia nas ciências geográficas.** In: *Brazil. Conselho Nacional de Geografia, Boletím Geográfico*, 10(108):304–312, May/June **1952. DWB**—Geomorphology as a geographic discipline (W. M. Davis) and as a branch of geology, as it is considered in most American colleges and universities, is discussed in all of its interrelationships with tectonics, economic geology, glacial geology, Pleistocene paleography, archaeology, climatology and human geography. Training of geographers is the subject of the final and crucial section. In the author's opinion, the teaching of climatology ranks first in geography courses, cartography second, but geomorphology should not be neglected. *Subject Headings:* **1. Geomorphology 2. Teaching of climatology. I. Davis, William Morris.**—*M.R.*

7.4–251 551.58(02)

Kostin, S. I. and Pokrovskaia, T. V., **Climatology.** An abridged translation to the preface and a complete translation of the table of contents to their **Klimatologiia,** 1953. 9 p. Typescript. (*See* 5.11–5, Nov. 1954, *MAB* for original, with 426 p. 146 figs., 74 tables, 19 refs., eqs.) **DWB**—*Subject Headings:* **1. Climatology 2. Translations.**

CLIMATE OF PARTICULAR PLACES

See also: **Mt. Rainier, Wash. & its glaciers** (Bender et al.), 7.4–3; **Climate of Japan** (Vivitskiĭ), 7.4–8; **Climate statistics** (S. Africa. Weather Bur.), 7.4–96.

7.4–252 551.582(899)

*Bergeiro Hargain, José María, **Actualización de los valores climatológicos normales, correspondientes a Montevideo.** [Compilation of the normal climatological values of Montevideo.] *Revista Meteorológica*, Montevideo, 13(48):15–24, June **1955.** 8 figs. **MH-BH**—Monthly and seasonal values for Montevideo are given in graphs or tables. They include means and absolute and mean extremes of temperature and relative humidity (1904–53), hourly means of wind velocity (1906–54) and means and extremes of pressure (1901–53). A graph of diurnal variation of temperature for Jan. illustrates the cold and hot periods of the day. *Subject Headings:* **1. Climatic data 2. Montevideo, Uruguay.**—*C.E.P.B.*

7.4–253 551.582.1:551.586(791)

Balchin, W. G. V. and Pye, Norman, **Climate and culture in southern Arizona.** *Weather*, 10(12):399–404, Dec. **1955.** 2 photos, 2 refs. **DWB**—A general account of the hot dry sunny climate of southern Arizona and the adaptations of life to it. Cooling methods in houses,

trains and autos, air conditioning, refrigeration, clothing and pattern of living are briefl described. *Subject Headings:* **1. Climatological sketches 2. Bioclimatology 3. Arizona.**— *C.E.P.B.*

7.4–254 551.582.1(861) 581.9:9

Rauh, W., **Peru. Landschaft und Menschen.** [Peru. Landscape and men.] *Un schau*, 56(1):9–12, Jan. 1, **1956.** 2 figs., 10 photos. **DLC**—General account of topograph and its effect on climate (including Garua), deserts, agriculture, etc. *Subject Heading* **1. Climate of Peru 2. Plant distribution 3. Peru.**—*C.E.P.B.*

7.4–255 551.582.2(46

*Portugal. Serviço Meteorológico Nacional, **Anuário Climatológico de Portugal, Vol. 8 1954, Pt. 1, Continente e Ilhas do Atlântico-Norte (Observações de Superfície).** [Climat logical Annual of Portugal, Vol. 8, 1954, Pt. 1, Continent and islands of the North Atlanti (surface observations).] Lisbon, **1955.** 132 p. almost entirely tables. **DWB, DLC**— Extensive tables of usual synoptic climatic data for 3 times daily and for the day at Lisbon Ponta Delgada, Azores; Funchal, Madeira and Mindelo (S. Vicente); and monthly means fo 103 stations on the Continent (Portugal), 7 in the Azores, 12 in Madeira, and 11 on Cap Verde Islands. In addition total, maximum and number of days ≥ 1 and ≥ 10 mm for abou 500 precipitation stations, global radiation (total and maximum) for each month for Pôrt Lisbon and Funchal, and monthly mean data for 1951–1952, 1953 and 1954 for Lajes Airport Azores. Tables include visibility, evaporation and state of soil. *Subject Headings:* **1. Climati data for Portugal 2. Annual climatic data summaries 3. Portugal 4. Azores 5. Madeir 6. Cape Verde Islands.**—*M.R.*

7.4–256 551.582.3(675

*Académie Royale des Sciences Coloniales, Brussels, **Atlas Général du Congo.** [Genera atlas of the Congo.] Brussels, pub. by the Academy, **1954.** Map (fold. colored). Als laid in: Bultot, F., **Notice de la carte des zones climatiques du Congo Belge et du Ruanda Urundi.** [Notes on the map of climatic zones of the Belgian Congo and of Ruanda-Urundi. 8 p. 5 figs., 8 tables, 20 refs. In French and Flemish (Flemish version of **Notice** laid i separately). Price: Fr. 200. **DWB**—A large, colored, 1:5,000,000 chart of the Belgian Cong and an inset chart 1:500,000 of the east central portion, with detailed explanatory text an tabular data for 6 representative cities in different regions. The isopleths of mean duratio of dry season, mean annual isohyets (mm), and climatic zones according to KÖPPEN are nicel portrayed on the chart and elaborated on in the text. *Subject Headings:* **1. Climatic atlase 2. Climatic zones 3. Belgian Congo. I. Bultot, F.**—*M.R.*

CLIMATIC CHANGES

See also: **Mt. Rainier, Wash. & its glaciers** (Bender et al.), 7.4–3; **Climatological maps & diagrams** (Monkhouse, Wilkinson), 7.4–9; **Glacier movement** (Heusser et al.), 7.4–68.

7.4–257 551.583.2:551.311.1

Bengtson, Kermit B. and Harrison, A. E. (*Univ. of Wash.*), **Glaciers reflect our changing climate.** *Mazama*, Portland, Oreg., 36(15):56–57, Dec. **1954.** photo, ref. **DWB**—Survey made in 1954 on glaciers of the Cascade Mountains in Oregon and Washington indicate tha snowfall was heavier, lasted longer, and that glaciers on Mt. Rainier (Nisqually Glacier) an on Mt. Baker (Coleman Glacier) are advancing and thickening; the latter has been advancing continuously since 1949 and advanced 70 80 ft from 1953–54. Glaciers are also becomin thicker at 4900 and 6000′ but >7000′ snowfall has been less than normal. Opinion is tha cooler summers and winters are responsible for anomalies. *Subject Headings:* **1. Glacie advances 2. Climatic variations 3. Cascade Mountains, Wash.**—*M.R.*

7.4–258 551.583.2:551.577.38:551.48

Godwin, Harry, **Recurrence-surfaces.** *Denmark. Geologiske Undersogelse*, 2(80):22–30 **1954.** fig., 7 refs. English summary p. 22; Danish p. 30. Abstracted from reprint. **DGS**—

he question of recurrence surfaces in peat bogs is discussed, from the point of view of British vidence. Recurrence surfaces are attributed to variations of rainfall. Dry periods are cognized from 1000 to nearly 500 B.C., very intense about 600 B.C. (late Subboreal), followed v a sudden climatic deterioration, and a short intense dry period in 60 B.C. to 50 A.D. *Subct Headings:* **1. Climatic changes 2. Historic droughts 3. Bogs.**—*C.E.P.B.*

7.4–259 551.583.3

Firbas, F.; Müller, H. and Münnich, K. O., **Das wahrscheinliche Alter der späteiszeitlichen Bölling"-Klimaschwankung.** [The probable age of the late-glacial "Bölling" climatic scillation.] *Naturwissenschaften*, 42(18):509, Sept. 2, **1955.** 3 refs. **DWB**—A rise of emperature immediately preceding the Allerød, and termed in Denmark the Bölling oscillation, as been found widespread in N. W. Europe. Carbon dating puts it about 11,000 B.C. or ightly earlier. As the older Allerød is in the 11th millennium B.C. the intervening tundra eriod can only have lasted a few centuries. *Subject Headings:* **1. Late glacial climates Quaternary climates.**—*C.E.P.B.*

7.4–260 551.583.3

Gregor, Alois, **Variace podnebí země v geologické době čtvrtohor.** [Changes in world imate during the quaternary geological period.] *Meteorologické Zprávy*, Prague, 7(1):13–18, eb. **1954.** 7 figs., tables, 13 refs. **DLC**—Reviews theories on the causes of ice ages. Includes iscussion of the theories of MILANKOVIČ (relative position of the earth and sun), SIMPSON ncrease in solar radiation) and FLINT (decrease in solar radiation). Present climatic changes re discussed mainly according to C. E. P. BROOKS. *Subject Headings:* **1. Climatic changes Ice ages 3. Quaternary climates.**—*G.T.*

7.4–261 551.583.3(787)

*†Leopold, Luna B. and Miller, John P., **Postglacial chronology for some alluvial valleys in Wyoming.** *U. S. Geological Survey, Water-Supply Paper*, No. 1261, **1954.** 90 p. 25 figs., tables, bibliog. p. 86–87. **DWB**—The major river basins in E. Wyoming have alluvial erraces about 40, 10 and 5 ft above present streams. The physiography is shown by block iagrams and sections and regional correlation discussed. A widespread feature is a soil rich calcium carbonate which was formed in the Altithermal (Climatic Optimum). The climatic equence was: melting in late Wisconsin 7800-7200 years ago with deposition of gravel; ncreasing aridity and erosion by summer rainstorms in continental low pressure followed by ncreasing aridity in high-index circulation with intensification of anticyclones (Altithermal); older and wetter than present with rapid disintegration of rocks by frost. The latter period ad 2 maxima, Moorcroft about 500 B.C., Lightning after 1400 A.D., separated by erosion. he paleohydrology is described. The climatic mechanism is based on WILLETT. Recent hysiography and problems of modern soil erosion are discussed. *Subject Headings:* **1. Postlacial climates 2. Wyoming.**—*C.E.P.B.*

7.4–262 551.583.3(470)

Mölder, Karl, **Kvartäärikautiset jääkaudet ja interglasiaalikaudet Neuvostoliitossa.** Quaternary age and interglacial periods in the U.S.S.R.] *Terra*, Helsinki, 67(2):48–55, **955.** 2 figs., 10 refs. In Finnish; German summary p. 55. **DLC**—Recent investigations in uropean and W. Asian U.S.S.R. show that there have been 3 ice ages and 2 interstadials. he second (Dniepr) glaciation was the most extensive, reaching nearly to Stalingrad (map). he third was the shortest and reached only to Valdai Hills and 150 km east of White Sea. he interglacials contained a temperate flora. In the late-glacial Eem Sea (White Sea area nd north of Caspian) a molluscan fauna lived which is now found on coast of Portugal and in Mediterranean. *Subject Headings:* **1. Quaternary climates 2. U.S.S.R.**—*C.E.P.B.*

7.4–263 551.583.3:551.4

†Pierzchałko, Łucja, **Zagadnienie dolin asymetrycznych na tle rozwoju geomorfologii limatycznej.** [Problem of asymmetric valleys in the development of climatic geomorhology.] *Czasopismo Geograficzne*, Warsaw, 25(4):359–372, **1954.** 30 refs. French sumary p. 371–372. **DWB, DLC**—Asymmetric valleys are periglacial formations cut in frozen

soil. They are of two types, one in which the steep slopes have a cold exposure, and the other, with both gentle and steep slopes, is oppositely oriented. Opinions differ as to whether they were formed by running water. Valleys with steep slopes and a southern exposure were formed in a more severe climate than those with steep slopes and a northern exposure. The geographical distribution of the two types in Europe and Siberia is described. *Subject Headings:* **1. Geomorphology 2. Quaternary climates.**—*C.E.P.B.*

7.4–264 551.583.3

Schmitz, H., **Was wissen wir von der Klimaentwicklung seit der letzten Eiszeit. Vegetationsgeschichtliche und moorkundliche Untersuchungen im nordwestdeutschen Flachland.** [What do we know of climatic development since the last Ice Age. History of vegetation and peat development in the northwest German plain.] *Umschau*, 55(22):685–687, Nov. 15 **1955.** 2 figs., 7 refs. **DLC**—A general diagram of the forest succession since 18,000 B.C. in Central Europe is given, showing also herb and dwarf shrub pollen which may be a better climatic indicator than tree pollen. Upland peat growth is the best rainfall indicator; 7 recurrence surfaces since 4000 B.C. indicate relatively dry periods. The detailed climatic history is complex. Evidence of tree limit is also summarized, including a suggestion of a warm period ending in 16th century. The cause of these cyclic changes is still unknown. *Subject Headings:* **1. Postglacial climates 2. Germany.**—*C.E.P.B.*

7.4–265 551.583.31

Antevs, Ernst, **Climate of New Mexico during the last glacio-pluvial.** *Journal of Geology*, 62(2):182-191, March **1954.** 2 tables, bibliog. p. 190–191. **DLC**—The probable modern snow line is defined as the level with 36°F as the mean June–Sept. isotherm. The snow line during the Cary glaciation age is derived from geological evidence and is found to be about 3000 ft lower than the present line. A 5.5°C lower temperature and 64% greater precipitation is assumed for the Cary age. The precipitation was derived from the probable hydrologic balance of Lake Estancia. *Subject Headings:* **1. Paleoclimatology 2. Glacial periods 3. Snow line 4. New Mexico 5. Lake Estancia, New Mexico.**—*A.A.*

MICROCLIMATOLOGY

See also: **Atmos. turbulence investigation** (Rösch), 7.4–29; **Nocturnal temp. rise** (Mano, Okazaki), 7.4–182.

7.4–266 551.584:631.67

Chudnovskiĭ, A. F., **Mikroklimat i teplovoĭ balans oroshaemogo polia.** [Microclimate and heat balance of an irrigated field.] (In: Akademiia Nauk SSSR, Institut Geografii [and] Institut Lesa, **Mikroklimaticheskie i klimaticheskie issledovaniia v Prikaspiĭskoĭ Nizmennosti.** Moscow, **1953.** p. 124–153. 15 figs., 11 tables, refs. **DLC**—The method and results of an investigation, in the summer of 1951, at the Engels Agricultural Experimental Station near Saratov, on the influence of irrigation and artificial rain in order to: 1) obtain quantitative indications of this influence, 2) explain from the viewpoint of the heat balance the regularities in the dynamics of the microclimate obtained under the effect of irrigation, and 3) determine on the basis of an analysis of the heat balance, the variation of evaporation on an irrigated field and compare it with same on nonirrigated sections. Comparative graphs show the humidity variations on irrigated and nonirrigated fields at different heights over the ground up to 2 m, and heat balance differences. *Subject Headings:* **1. Field microclimatology 2. Irrigation effects 3. Saratov Region, U.S.S.R.**—*A.M.P.*

7.4–267 551.584.31:634.8

*Uehara, Masaki (*Kagawa Agri. College*), **Micrometeorological study in summer at the north-sloping vine-garden.** *Kagawa, Japan. Agricultural College, Technical Bulletin* 1(2):27–38, Oct. **1949.** photos, graphs, tables, 10 refs. English summary p. 36–38. **DWB**—Micrometeorological observations of temperature, humidity, evaporation, wind and soil temperature were made on the slope farm (vineyard) on Aug. 6 and 7, 1949 as part of a study which has continued since July 1948. Assman aspiration psychrometer, siphon-type ground

ermometer, Hirata paper evaporimeter and Robinson cup anemometer were used for measements. Results are discussed and shown in graphs and tables. *Subject Headings:* **1. Slope icroclimatology 2. Vineyards 3. Kagawa Agricultural College, Japan.**—*M.R.*

7.4–268 551.584.41:551.525.4

Klintsov, A. P., **O temperature pochvy v elovo-listvennykh nasazhdeniiakh razlichnogo ozrasta.** [Soil temperature in deciduous spruce plantings of varying age.] *Pochvovedenie*, oscow, No. 6:83–86, June **1955.** 3 figs., table. **DLC**—The heavy soils with excess soil oisture of spruce plantings at the Lisinsk experimental forest station are characterized by reat heat capacity and conductivity and are also colder. The soil temperature at depths of 10, 20 and 30 cm below the surface was investigated under different stages of growth of the eciduous fir. Data on the amplitude of variation of soil temperature in degrees for four fferent growth stages are given in a table and the variation of mean monthly (1) surface mperature, (2) temperature at 10 cm, and (3) at 30 cm are shown in graphs. In clearings id other open spaces the heat regime of the soil was more favorable. *Subject Headings:* **Soil temperatures 2. Soil moisture 3. Deciduous trees.**—*I.L.D.*

7.4–269 551.584.41(66)

*Kullenberg, Bertil, **Quelques observations microclimatologiques en Côte-d'Ivoire et uinée Française.** [Some microclimatological observations on the Ivory Coast and on French uinea.] *Institut Français d'Afrique Noire, Dakar, Bulletin, Ser. A.*, 17(3):755–768, July **955.** 5 photos, 8 tables, 7 refs. **DWB**—Measurements of temperature and humidity in the yer of air near the ground were made in the tropical rain forest of Taï and on Mount Nimba nd a nearby savannah at 1650 m and 500 m during a trip from the Ivory Coast and French uinea, respectively, from Aug. 5 to Aug. 17, 1954. Temperature data at 5, 170, 600 and 000 mm above the ground, and on a black surface, wind speed at 500 mm, cloudiness, etc. re reported for 7 runs of 1 to 10 hrs length. Forest and cloud influences and relation to plant nd animal ecology are discussed. *Subject Headings:* **1. Forest microclimatology 2. Forest nfluences 3. Microclimatic data 4. Ivory Coast 5. French Guinea.**—*M.R.*

7.4–270 551.584.43

Sauberer, F., **Der Baum in der Grossstadt.** [The tree in the large city.] *Wetter und eben*, Vienna, 7(3/4):77–78, **1955.** 3 refs. **DLC**—The author inveighs against the practice of ndiscriminately cutting down trees in cities and summarizes the advantages of trees in providng protection against cold, radiation in summer months, air purification, wind protection, etc. *Subject Headings:* **1. Tree microclimatology 2. Shading devices 3. Urban climates.**—*I.L.D.*

CLIMATIC CLASSIFICATION

See: **Natural regions of Amapá** (Magnanini), 7.4–228.

BIOCLIMATOLOGY

See also: **Climate & culture** (Balchin, Pye), 7.4–253.

7.4–271 551.586:612

Spring fever helps. *Science News Letter*, 68(3):47, July 16, **1955. DWB**—This brief note states that the water added to the circulatory system to keep the body cool during the irst hot days does not parallel the increase in red blood cells. When the blood is thin you re more susceptible to hay fever. When the balance is being restored, later in summer, additional moisture absorption causes enlarged blood vessels, causing the sweat glands to work to get rid of the heat. *Subject Headings:* **1. Cooling power 2. Heat tolerance 3. Circulatory system.**—*W.N.*

7.4–272 551.586:612

Stafford, Jane, **Freezing to live.** *Science News Letter*, Wash., D. C., 67(23):362–363, June 4, **1955.** photo. **DWB**—Various methods of hypothermia in use here and abroad

are outlined and discussed. The requirement for oxygen is decreased when the body's temperature is lowered to 75°F. This enables intricate surgical operations, otherwise performed at very great risk of life. Theoretically, no demand for oxygen would exist if the human body could be safely cooled to 53–54°F. Survival in the Arctic may benefit from this knowledge of semihibernating sleep. *Subject Headings:* **1. Biometeorology 2. Medical meteorology 3. Hypothermia.**—*W.N.*

7.4–273 551.586:612

Stafford, Jane, **How to keep cool.** *Science News Letter*, Wash., D. C., 68(4):58–59, July 23, **1955.** photo. **DLC**—This is a popular review of new findings within the fields of nutrition, diet, sleep and housing on how to maintain the human body's coolness during hot summers. Established theories are replaced by some recent discoveries and biological experiments. *Subject Headings:* **1. Heat effects on man 2. Cooling power.**—*W.N.*

7.4–274 551.586:612.014.43

*Baker, Paul T.; Byrom, Robert F.; Daniels, Farrington, Jr. and Munro, Ella H. (*all Stress Physiology Branch*), **Relationship between skinfold thickness and body cooling at 59°F.** *U. S. Quartermaster Corps. Research and Development Command. Environmental Protection Division, Technical Report*, EP-14, July **1955.** 21 p. 10 figs., 3 tables, 17 refs. **DWB**—The relationship between body fat and body temperature was studied by exposing lightly clad inactive subjects to ambient temperatures of 59°F for two hrs. Skin temperatures over various parts of the body, rectal temperatures and skin fold thickness as on chest and waist were measured. It was found that the greater the percent content of fat in the body the lower were the skin temperatures. A high correlation existed also between minimum rectal temperatures and percent of fat. The data are presented in tables and in graphs. *Subject Headings:* **1. Heat tolerance 2. Body temperature 3. Body fat.**—*I.L.D.*

7.4–275 551.586:612.014.43

†*Stein, Harold J.; Eliot, Johan W. and Bader, Richard A., **Physiological reactions to cold and their effect on the retention of acclimatization to heat.** *U. S. Quartermaster Corps. Research & Development Branch, Environmental Protection Section, Report*, No. 142, Dec. 29, **1948.** 26 p. 12 figs., 2 tables, 42 refs. Cover-title: **Body reactions to successive exposures to heat and cold. DLC**—Three physically conditioned white males were exposed successively to periods of heat (107°F dry bulb and 89°F wet bulb, wind 3–4 mph) and then to periods of cold (−20°F, wind 3–4 mph), and then re-exposed to heat. Measurements were made of pulse rate, rectal temperature, metabolic rate, sweat loss, blood plasma and "available fluid" volumes, hematocrit and plasma proteins and chloride balance (data are given in graphs and tables). It was found that only a small amount of heat acclimatization is lost during prolonged intermittent exposure to extreme cold, and that the basal metabolic rate did not change significantly during the heat or cold exposures. Large amounts of water and salt were continually lost during the periods of cold exposure. Also increased vasoconstriction was observed with repeated exposures to cold. *Subject Headings:* **1. Heat tolerance 2. Cold effects on man 3. Temperature effects 4. Acclimatization.**—*I.L.D.*

7.4–276 551.586:612.014.4

Price, A. Grenfell, **Climate and work in New Guinea.** *Geographical Review*, 45(1):121–123, Jan. **1955. DWB**—A discussion of the problem of suitability of tropical regions, such as Australian New Guinea, for white settlement, based on Isadore L. Dordick's article in *Acta Tropica*, **1953** showing that effective temperatures at elevations such as Bulolo (2300 ft) or Kokoda (1200 ft) "lie within the comfort range of 66–75°F effective temperature and within the limits of atmospheric tolerance for severe physical exertion." The statistics were checked by Bruce Mason of the Commonwealth Meteorological Branch, who found them representative. Various other problems (political, economic, health and population) are discussed in relation to the desirability of the area for white settlement. (*See also* 5.1–4, Jan. 1954, *MAB.*) *Subject Headings:* **1. Comfort climate 2. Tropical bioclimatology 3. Australian New Guinea. I. Dordick, Isadore L. II. Mason, Bruce.**—*M.R.*

7.4–277 551.586:616.9

May, J. M. (*Am. Geog. Soc.*), **The geography of disease: the American Geographical Society's approach to the problem.** *Meteorological Monographs*, 2(8):104–110, Oct. **1954.** fig., table, 8 refs. **DWB**—Bioclimatology is considered by the author as a subdivision of the general field of the geography of disease. From this point of view, bioclimatology is restricted as to its scope and becomes an adjunct to other geographical factors involved directly and indirectly in pathogenesis. In this article its indirect role in infectious diseases is stressed. The author outlines a "census" method for correlating disease with geographical factors. *Subject Headings:* **1. Bioclimatology 2. Infectious diseases.**—*I.L.D.*

7.4–278 551.586:628.8

Everetts, John, Jr. (*ASHAE Tech. Advisory Comm. on Weather Data*), **Weather data.** *Heating, Piping and Air Conditioning*, Chicago, 27(3):156, March **1955.** port. **DWB**—A general discussion of usefulness of meteorological and climatological data and forecasts in industry and commerce and an outline of plans for 1956 by the American Society of Heating and Air Conditioning Engineers, Technical Advisory Committee on Weather Data, based on 300 answers from 600 members. All winter dry bulb data for U. S. will be revised and published in the Guide for 1956. Later the summer dry bulb and wet bulb data, winter dry bulb and wind, summer dry and wet-bulb combinations and durations, combinations of temperature and solar radiation, etc. will be calculated from USWB files. *Subject Headings:* **1. Meteorological data for air conditioning 2. Dry-bulb temperature data 3. Air conditioning.**—*M.R.*

7.4–279 551.586:633

Azzi, Girolamo (*Univ. of Perugia*), **Le leggi della bioclimatologia.** [The laws of bioclimatology.] *Geofisica e Meteorologia*, Genoa, 2(3/4):59–61, May/Aug. **1954.** fig. **MH-BH**—The author describes the construction of a thermopluviometric diagram for representing the frequency of favorable and unfavorable combinations of temperature and rainfall for the growth of grain and providing a theoretical basis for determining geometrically physiographic zones. The bioclimatic laws derived involve the distribution of extrinsic or environmental factors and of intrinsic factors—yield and resistance. *Subject Headings:* **1. Bioclimatology 2. Grain crops 3. Thermopluviometric diagrams.**—*I.L.D.*

ENVIRONMENTAL INFLUENCES

See: **Forest meteorology** (Primault, Kuhn), 7.4–60; **Topographic influences** (Heigel), 7.4–99; **Windbreak effectiveness** (Matsui, Shinohara), 7.4–213; **Wave formation in atmos.** (Stranz), 7.4–219; **Forest types** (Ivanov), 7.4–223; **Precip. probabilities** (Schneider-Carius, Essenwanger), 7.4–229; **Snow cover distribution** (Dona'), 7.4–241; **Snow cover depths** (Kataoka), 7.4–243.

MISCELLANEOUS

COSMIC INFLUENCES

See also: **Eclipse effects** (Schieldrup Paulsen), 7.4–15; **Atmos. elec. obs.** (Mühleisen), 7.4–290.

7.4–280 551.590.21:525.5

Krivsky, L. (*Astrophysical Obs., Ondrejov, Czech.*), **Relation of sunspot recurrency to the duration of cold and warm seasons.** *Bulletin of the Astronomical Institutes of Czechoslovakia*, Prague, 4(2):44–47, **1953.** 3 figs., 5 refs. In English; Russian summary p. 47. **DLC**—The relation of the length of winter and summer (as calculated by JILEK for 1881 1938 on the basis of meteorological and phenological data) to the Eigenson "recurrency index A" (which is based on the repetition and duration of sunspots) indicates that the duration of winters after maximum "recurrency" is about 75 days and after minimum "recurrency" is about 90 days. *Subject Headings:* **1. Solar influences 2. Sunspot recurrency index 3. Length of seasons.**—*M.R.*

7.4–281 551.590.25:551.57

Meteor dust causes rain. *Science News Letter*, Wash., D. C., 68(5):66, July 30, 1955. **DLC**—Note on CWILONG's article in *Nature* (*see* 6I–132, Sept. 1955, *MAB*) regarding discovery of dust (not radioactive) in air at Panama at time of torrential rains and a month after meteor shower. *Subject Headings:* **1. Meteoric dust effects on rainfall 2. Bowen's theory 3. Cloud seeding by meteoric dust. I. Cwilong, B. H.**—*M.R.*

VISIBILITY

7.4–282 551.591.

Gregory, R. L. and Cane, Violet, **A statistical information theory of visual thresholds.** *Nature*, London, 176(4496):1272, Dec. 31, **1955.** 2 refs., 7 eqs. **DWB**—From observations the authors deduce

$$\frac{\Delta I}{I+k} = \text{const.} \sqrt{\left(\frac{1}{A_1}+\frac{1}{A_2}\right)+C},$$

where I is the visual threshold intensity, A_1 and A_2 the stimulus and background areas and k about 0.04 ft l. Various forms of this are discussed. *Subject Heading:* **1. Visibility theory.**—*C.E.P.B.*

OPTICAL PHENOMENA

7.4–283 551.593.

Abnormal refraction [in] Arabian Sea; Mediterranean Sea; Strait of Gibraltar; Gulf of Suez. *Marine Observer*, 25(170):213-214, Oct. **1955.** 2 figs. **MH-BH**—In Arabian Sea just after sunset bright patches of light travelled round horizon in a clockwise direction. In Mediterranean two suns at sunrise. In Strait of Gibraltar inverted refracted image of rising crescent moon. In Gulf of Suez unusual visibility of distant hills. *Subject Heading:* **1. Refraction phenomena.**—*C.E.P.B.*

7.4–284 551.593.

"Blobs" of air cause some stellar twinkling. *Science News Letter*, Wash., D. C., 68(6):87, Aug. 6, **1955. DLC, DWB**—Small parcels of air of different density, temperature and water vapor content from surrounding air, endure for some time and cause stellar twinkling. Persistance can be measured by watching contrails from planes. *Subject Heading:* **1. Stellar twinkling.**—*M.R.*

7.4–285 551.593.

Twinkling of stellar radio waves studied. *Science News Letter*, 68(1):3, July 2, **1955. DLC**—Preliminary studies by C. GORDON LITTLE show a marked difference between the way radio stars twinkle in England and in Alaska. Size, shape and movement of the dense regions in the ionosphere are indicated by the twinkling. *Subject Headings:* **1. Stellar twinkling 2. England 3. Alaska. I. Little, C. Gordon.**—*W.N.*

7.4–286 551.593.

Shifrin, K. S., **K teorii rasseianiia sveta na primesiakh v atmosfere i gidrosfere.** [Theory of light diffusion in admixtures in the atmosphere and hydrosphere.] *Akademiia Nauk SSSR Doklady*, 59(3):483–486, Jan. 21, **1948.** table, ref., 6 eqs. **DLC**—A formula for the intensity of scattered light when the field inside the particle scattering the light coincides with the external field has been developed by Y. ROCARD, but the effect of polarization of the substance inside the particles was disregarded and the formula was therefore found unsatisfactory. In this paper the author solves the same question proceeding from Maxwell's equations, which with the aid of Hertz vector, are modified into an integral equation determining the spatial part of an effective electric field, both inside and outside of the sphere. The integral equation is solved by successive approximations, i.e. expansions in terms of α, a parameter depending on the electric polarization. The method can be also applied to particles of smoke in which the coefficient of refraction is not too large, as the electric conductivity of smoke particles is usually small. *Subject Headings:* **1. Light diffusion 2. Scattering of light.**—*A.M.P.*

7.4–287 551.593.55

Crepuscular rays [in] Caribbean Sea [and] Sunset rays [in] Indian Ocean. *Marine Observer*, 25(170):215–216, Oct. 1955. photo, fig. MH-BH—Photo of a spectacular display of crepuscular rays in 11°N 76°W 5 minutes after sunset on Nov. 4, 1954. Sketch of an arc of violet rays to an altitude of 47° in 5°S 66°E on 31 Dec. 1954. *Subject Headings:* 1. Crepuscular rays 2. Twilight phenomena.—*C.E.P.B.*

7.4–288 551.593:52:535.8:523.77

Menzel, Donald H.; Warwick, James W. and Larence, Robert S., **A dynamic spectrum analyzer for Sacramento Peak.** Harvard Univ. Harvard College Observatory. Solar Dept., Contract AF 19(604)-146, Scientific Report, No. 20, Jan. 6, 1955. 12 p. 8 figs. WB—Analysis of optical observations of flares and associated chromospheric activity emphasized the importance of building at Sacramento Peak a dynamic radio-spectrum analyzer similar to that now in use at the Commonwealth Scientific and Industrial Research Organization near Sydney, Australia. Dynamic spectra of the radio region, taken simultaneously with observations of associated optical activity, would provide a powerful tool for study of many solar-terrestrial effects. In particular, such an instrument promises to be of special value in studies of magnetic and ionospheric storms, solar cosmic ray sources, sudden ionospheric disturbances and the aurora borealis. Sec. II of this report discusses the observations that support this conclusion. Sec. III of the report analyzes the requirements for a dynamic spectrum analyzer, with special reference to its planned use in conjunction with optical observations, and establishes general specifications for such equipment. The requirements imposed by the optical records have been coordinated with the limitations of electronics, so that the proposed design is consistent with the present-day techniques of radio engineering. *Subject Headings:* 1. Spectrum analyzer 2. Solar-terrestrial relationships.—*Authors' abstract.*

7.4–289 551.593.61

Naik, Y. G. and Joshi, R. M. (*both, Gujarat College, Ahmedabad, India*), **Anti-coronas or Brocken bows.** *Optical Society of America, N. Y., Journal*, 45(9):733–736, Sept. 1955. 3 figs., table, 8 refs., numerous eqs. DLC—Brocken bows are sometimes observed in natural clouds as spectrum colored rings surrounding the shadow of one's head. This phenomenon was reproduced in the laboratory by illuminating an artificial cloud produced by adiabatic expansion in a large cloud chamber. The light scattered in the backward direction by a cloud was observed by transverse reflection in a convex mirror kept in the path of a beam of light incident on the cloud. A reduced image of the shadow of the mirror on the cloud was seen surrounded by a series of spectrum colored rings. About three to four orders of the rings of a given color were often observed. The size of the rings of a given color depends on the size of the water drops in the cloud. The size of the water drops in the cloud was determined by measuring the apertures of the diffraction rings (coronas) seen by transmitted light. It is found that in the case of Brocken rings $\alpha \sin\gamma n = \pi(n - 1.22)$, where $\alpha = 2\pi r/\lambda$, r being the radius of water drops, λ the wavelength of light, and γn the angular aperture of the nth-order bright ring. It is also shown that the size of drops in natural cloud in which Brocken bows are seen, should be near about 13.5μ. *Subject Heading:* 1. Brocken bows.—*Authors' abstract.*

ELECTRICAL PHENOMENA

See also: **Ionization chambers** Imbò, Vittozzi, 7.4–114; **Airborne radioactivity sampling** (Heslep, Bellamy), 7.4–128; **Ionospheric reflection** (Bramley), 7.4–132; **Rain 3 weeks old,** 7.4–236.

7.4–290 551.594.11:551.590.24

Mühleisen, R. (*Max-Planck-Inst. for Physics*), **Luftelektrische Beobachtungen während der Sonnenfinsternis am 30.6.1954.** [Atmospheric electricity observations during the solar eclipse of June 30, 1954.] *Geofisica Pura e Applicata*, Milan, 30(1–4):106–112, Jan.–April 1955. 3 figs., 8 refs. German, English and French summaries p. 106. MH-BH—The registrations of potential gradient and small ion density on June 29 and 30, 1954 on the west coast of South Sweden show extraordinary deviations during and after the solar eclipse. They

are discussed in connection with the inhomogeneous conditions on the coast as a consequence of the surf and the jump of the small ion concentration from sea to land. *Subject Headings:* **1. Atmospheric potential gradient measurement 2. Eclipse effects 3. Solar eclipse, June 29–30, 1954 4. Swedish Coast.**—*Author's abstract.*

7.4–291 551.594.1.

Siksna, R. (*Inst. of High Tension Res., Univ. of Uppsala, Sweden*), **Mobility of small atmospheric ions in the air from the ground at Uppsala.** *Journal of Atmospheric and Terrestrial Physics*, London, 4(4 i.e. 3):106–111, **1953.** 5 figs., 3 refs. **DWB**—By counting the ions in the air below a sheet covered over the ground, using a simple aspiration condenser, it is shown that the small ions must be divided with respect to their mobilities into two fractions which may be attributed to the initial small ions and the affected small ions. The ions counted were formed by the radioactive substances exhaled from the soil. It was observed that the mobility distribution of the ions depended on the speed with which the air was sucked through the intake pipe to the counter. *Subject Headings:* **1. Ion mobility 2. Ion count method**—*Author's abstract.*

7.4–292 551.594.14:551.510.42:5

Harbour, Dave, **The cloud over sheep mountain.** *Sports Airfield*, N. Y., 134(1):30–31, July **1955.** photos. **DLC**—Attempts to determine effect of atomic fallout from series of tests at Yucca Flat in Nevada on wild sheep, rabbits, etc. have been made and conclusion is that no serious damage has been done to wildlife in area, though some skin burns from β radiation might occur within 10 or 20 mi of the detonation. Extreme care has been taken in firings to see that winds would not carry hot debris to any distance. *Subject Headings:* **1. Radioactive fallout effects on wildlife 2. Atom bomb tests 3. Yucca Flat, Nevada.**—*M.R.*

7.4–293 551.594.14

Reiter, Reinhold, **Der Emanationsgehalt der Luft in den nördlichen Kalkalpen in Abhängigkeit von atmosphärischer Schichtung und Windrichtung.** [On the emanation content of the air in the northern Chalcolithic Alps in relation to atmospheric structure and wind direction.] *Naturwissenschaften*, 42(23):622–623, Dec. **1955.** fig., 2 refs. **DWB**—Determinations of thoron and radon were made on Zugspitze plateau Aug.–Sept. 1955. In temperature inversions there were 530 impulses/min compared with 335 in convective weather. With SW–SE winds emanation was 4.3 times that with winds from W–N–E. These results are of interest for atmospheric electricity and bioclimatology. *Subject Headings:* **1. Radioactive emanations 2. Zugspitze, Bavarian Alps.**—*C.E.P.B.*

7.4–294 551.594.14:662.2:539.1(02

*U. S. Air Weather Service, **Radioactivity fall-out plots.** Its *Air Weather Service Manual* 105-33, Oct. 15, **1954.** 22 p. 15 figs. (incl. tables) "Supersedes its *AWS Manual* 105-33, June 2, 1952." **DWB**—A detailed manual outlining procedures and illustrating methods for determining areas which only become contaminated with radioactive particles within 6 hr after an explosion of a fission or a fusion bomb. Equipment, wind vector diagram, ground fallout plot, and transmission of ground fallout data, constitute the major headings. Air bursts do not, as a rule, provide much fallout hazard. Surface bursts kick up a lot of dust which is carried down wind. Subsurface bursts carry into the atmosphere a tremendous amount of material: distance depends on (1) cloud height, (2) size of particles and (3) mean wind speed. Heights of 60,000 ft are estimated as the ceiling for small particles. Decay, rain washing out, and vertical currents are not considered in procedure outlined. Forecasting degree of contamination is not considered, either. *Subject Headings:* **1. Radioactive fallout calculation manuals 2. Radioactivity in the atmosphere.**—*M.R.*

7.4–295 551.594.22:7

Chernov, V. M. and Chirvinskiĭ, P. N., **Fotografirovanie molniĭ.** [Photographing lightning.] *Priroda*, Moscow, 43(10):116, Oct. **1954.** illus. **DLC**—Description of lightning photographs made with a Zeiss-Ikon camera on May 1, 1953, during a severe thunderstorm. Photographs show lightning without thickening, double lightning with numerous branches

d thickenings, and lightning with three knots and thickenings. *Subject Heading:* **1. Lightning otographs.**—*I.L.D.*

7.4–296 551.594.223

Nauer, Herbert, **Modellversuche zum Kugelblitz.** [Model experiments on ball lightning.] *itschrift für angewandte Physik*, 5(12):441–450, **1953.** 3 figs., 9 refs. **DLC**—After a review various experiments in which it was attempted to produce ball lightning in the laboratory, e author gives a detailed description of an experiment which he believes produced a phenomenon closely resembling natural ball lightning. According to this experiment, ball lightng can be explained as the burning of small concentrations of inflammable gases in the mosphere below the regular ignition temperature. *Subject Heading:* **1. Ball lightning.**—*G.T.*

7.4–297 551.594.25

Chalmers, J. Alan and Smith, L. G., **The charging of rain by splashing.** *Royal Meteorogical Society, Quarterly Journal*, 81(350):618–619, Oct. **1955.** 6 refs. **DWB**—Chalmers points to evidence against Smith's suggestion (*R. M. S. Q. J.*, 81:23–47, Jan. **1955**; *see* 6.6–338, une 1955, *MAB*) that the negative potential gradient and positive rain current are due to plashing. Smith replies. *Subject Heading:* **1. Electricity of precipitation.**—*C.E.P.B.*

AURORAS

See also: **Polar aurora** (Störmer), 7.4–6.

7.4–298 551.594.5

Meek, J. H., **East-west motion of aurorae.** *Astrophysical Journal*, 120(3):602–603, Nov. **1954.** fig., 4 refs. **DLC**—Few references to east-west motion of auroral depressions r rays have been found in the literature since Tromholt first reported them in 1885. During Dec. 1953–April 1954 photographs taken with a 16 mm camera at Saskatchewan Univ. show nat out of 58 forms, 19 showed definite easterly motion and 14 a westerly motion, and these 4 all occurred before 2 a.m. whereas the other 44 were scattered through the night. Speeds stablished at 200–500 m/sec. Thus about half of the auroral displays showed definite eastvest motion and when westward motion occurs it is apt to be during the first half of the night. *Subject Headings:* **1. Auroral drift 2. Diurnal effects on auroral drift.**—*M.R.*

7.4–299 551.501:551.594.5

†Paton, James, **The observation of aurora.** *International Council of Scientific Unions, Brussels, Eighth Report of the Commission for the Study of Solar and Terrestrial Relationships.* Paris, **1954.** p. 157–167. 33 refs. **DWB**—Early maps of isochasms are based on inadequate ata and close networks of observing stations have been recently established, supplemented by bservations on transatlantic stratocruisers. Aids to observing, analysis and classification are escribed; use of punched cards is suggested. Use of radio echoes is discussed. The paper nds with a list of outstanding problems. *Subject Heading:* **1. Auroral observation programs.** —*C.E.P.B.*

7.4–300 551.594.5(211.2)

Thomsen, I. L. (*Carter Obs., Wellington, N. Z.*), **The aurora australis.** (In: Simpson, Frank A. (ed.) **The Antarctic today.** Wellington, Reed, **1952.** p. 261–278. 6 photos.) **DWB**—A general discussion of the aurora in the Southern Hemisphere: places where observed, ypes of auroras with remarks on actual cases, a map of zone of greatest frequency (eccentric with displacement toward Indian Ocean at 120°E and away from South America) showing avorable location of Tasmania and New Zealand for auroral observation, remarks on present esearch and observation programs in New Zealand (Carter Observatory and 300 voluntary bservers), Macquarie and Heard Islands (in the max. zone auroras are observed on 100% of the days when it is dark, the author states), and a summary of present auroral theory which gives strong indications that atomic particles from some sort of solar disturbance are involved. *Subject Headings:* **1. Aurora australis 2. Auroral frequencies 3. New Zealand 4. Antarctic.** —*M.R.*

PART II. ANNOTATED BIBLIOGRAPHY ON COSMIC RAYS IN THE ATMOSPHERE (1953–1956)

By: *Mary L. Rice and Geza Thuronyi*

INTRODUCTION

The first part of this bibliography (covering the literature through 1952) was published in the March issue of *MAB*. This second part covers the period from 1953 to date. The subject matter included has been outlined in the introduction to the March bibliography. Some practical aspects of cosmic-ray studies have been included in this second part, such as: the use in calibrating radioactive snow gages, ionization measurement, space travel, etc. In the subject outline which follows the numbers (in parentheses) beginning with 7C– refer to items in the March issue. They have been added for the reader's convenience, so as to provide a single perspective of both parts of the bibliography.

A few abstracts, not repeated here, will be found in other issues of *MAB* (for example 6.7–204 7.3–106 and 7.3–291).

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1953

7D–1 551.521.6

Amaldi, E.; Mezzeretti, L. and Stoppini, G. (*Physics Inst., Rome*). **On the longitudinal development of air showers according to Fermi's theory of meson production.** *Il Nuovo Cimento,* Bologna 10(6):803–816, June 1, 1953. 12 figs., 2 tables, refs. Italian summary p. 816. **DWB**—The longitudinal development of an air shower produced by a primary proton of 10^{14} eV has been calculated numerically, with the method of successive collisions, under the assumption that in th

llision between two particles the production of pions and nucleons follows the thermodynamic approximation of FERMI's theory. In the high energy region ($W \gtrsim 5000$ GeV) there is production of π^+ and π^- mesons as well as pairs of nucleons, while the low energy region only π^+ and π^- are produced. the low energy region the calculations have been done under two different assumptions: in case A collision is totally anelastic, while in case E, the energy available in the center of gravity frame reference is divided equally among the produced mesons and the nucleons taking part in the collision. The development of the various components throughout the atmosphere is given graphically. While the ratio of the right order of magnitude in both cases (1% in case A and 3% in case the penetrating component is too rich in nucleons especially in case E. *Subject Headings:* 1. Cosmic ray showers 2. Fermi theory.—*Authors' abstract.*

7D–2 551.521.64:537.591.1

Baskin, R. and Winckler, J. R. (*Univ. of Minnesota, Minneapolis*). Relative ionization of cosmic-ray μ mesons in a liquid scintillator. *Phys. Rev.*, 92 (2) :464–467, Oct. 15, 1953. 4 figs., table, 11 foot-refs., 4 eqs. DWB—Measurement of the rise in energy loss of μ mesons of energy between 1.5 Mev and 2200 Mev in traversing an xylene solution have been made. The observed pulse-height distribution is compared with the most probable energy loss and median energy loss as found using the LANDAU theory without a density correction and with a density correction as calculated by BERNHEIMER. The result of this measurement favors a density correction to the theory of energy loss. *Subject Heading:* 1. Cosmic ray mesons.—*Authors' abstract.*

7D–3 551.521.64:537.591.15

Bassi, P.; Clark, G. and Rossi, B. (*Dept. of Physics and Lab. of Nuclear Science, Mass. Inst. Tech.*). Distribution of arrival times of air showers particles. *Physical Review*, 92 (2) :441–451, Oct. 15, 1953. 12 figs., table, 9 refs., eqs. DWB—The instantaneous distribution of particles in extensive air showers at sea level has been studied by measuring the relative delays between particles with three liquid scintillation counters. The delays measured were in the range from 5 to 300 mμ sec. The sizes of the showers were in the range from 10^5 to 10^6 particles. Using statistical methods of analysis it was found that at a given instant most electrons with energies of $\sim$20 Mev lie in a thin disk of thickness between 1 and 2 m. The particles which can penetrate at least 20 cm of lead lie in a disk of thickness between 2 and 3 m. The disk of penetrating particles follows behind the disk of electrons by less than 3 m. The projected zenith angles of the axes of individual showers were measured by measuring the delays between widely spaced counters. The standard deviation in a measurement of the sine of the projected zenith angle of a shower was 0.13. The root mean square of the sines of the projected zenith angles was found to be 0.24 ± 0.015. If we assume a $\sin^n \theta$ distribution law for the projected zenith angles we find $n = 1.5 \pm 1.2$. The spatial orientations of the axes of individual showers were determined by measuring the projections of the zenith angles in two mutually perpendicular planes. *Subject Headings:* 1. Cosmic radiation 2. Cosmic ray showers.—*Authors' abstract.*

7D–4 551.521.64:537.5

Beiser, Arthur. Where do cosmic rays come from? *Scientific Monthly*, 77 (2) :76–79, Aug. 1953. 9 refs. DWB—A short popular article giving some of the known facts about cosmic rays and their proposed origin and lines of research followed from their discovery by GOCKEL (1910) and HESS (1912) to present day work attempting to reproduce them in the laboratory and to explain the high energies of cosmic rays. *Subject Headings:* 1. Cosmic ray research 2. Cosmic ray origin.—*M.R.*

7D–5 551.521.64:612.12

Bloch, Vera. Über einen Tagesgang der Takata-Reaktion und seine klinische Bedeutung. [On diurnal variation of the Takata reaction and its clinical importance.] *Naturwissenschaften*, 40 (12) :347, June 1953. 4 refs. DWB—Blood samples from several men and women at intervals from before sunrise to sunset failed to show any definite diurnal variation of the Takata reaction. *Subject Heading:* 1. Takata reaction.—*C.E.P.B.*

7D–6 551.521.64

Broxon, J. W. (*Dept. of Physics, Colorado Univ., Boulder*). Chree analysis of pressure-temperature-corrected cosmic-ray burst frequencies. *Il Nuovo Cimento*, Bologna, 10 (10) :1434–1440, Oct. 1, 1953. fig., foot-refs. Italian summary p. 1440. DLC—By CHREE's method of superposed epochs, recurrence phenomena and relations to other variables had been found in the frequency of occurrence of small cosmic ray bursts in a heavily shielded counter at 1640 m altitude and 49°N geomagnetic lat. The recurrences at intervals of about 27 days have been found to persist after correction of the burst data for variations in barometric pressure and atmospheric temperature by application of the very large coefficients, -4.58 ± 0.22 percent/mm Hg and -2.53 ± 0.10 percent/°C, determined recently. A defense of the CHREE method of analysis is included. *Subject Headings:*

1. Cosmic ray burst frequencies 2. Pressure effects on cosmic rays 3. Temperature effects on cosmic rays.—*Author's abstract.*

7D–7 551.521.64:537.

Cachon, A., **Le rayonnement cosmique dans l'atmosphère.** [Cosmic radiation in the atmosphere.] *La Météorologie*, 4th Ser., No. 32:253–259, Oct./Dec. **1953.** 2 figs., table. French, English and Spanish summaries p. 253. **MH-BH**—The various types of "particles" which make up the atom, under the new relativity concepts and according to findings based on cosmic ray research are listed in tabular form and their characteristics also tabulated (symbols, mass, charge, stability and mean life) and discussed at length. Methods of observation (ion chamber, Geiger-Müller counter, Wilson cloud chamber and photographic emulsions), and origin of cosmic rays, changes occurring and in the atmosphere, and the energies involved are also discussed. *Subject Headings:* **1. Cosmic radiation 2. Terminology.**—*M.R.*

7D–8 551.521.6

Cadorin, D. (*Padova*), **Sulla componente elettronica della radiazione cosmica nell'atmosfera derivante dal decadimento dei neutretti.** [The electronic component of cosmic radiation in the atmosphere originating from the breakdown of neutrons.] *Il Nuovo Cimento*, Bologna, 10(4):364–379, April 1, **1953.** 4 figs., 2 tables, foot-refs., eqs. English summary p. 379. **DWB**—The contribution from the π^0 meson decay into two photons to the electronic component of cosmic radiation in passing through the atmosphere, is calculated; the diffusion equations are used with a generating function for the photons whose energy dependence is taken from the experimental data of the Bristol group, and whose variation with the altitude is derived from an absorption length of 130 $g \cdot cm^{-2}$. The diffusion equations are integrated by a method of successive approximations, taking into account both the ionization energy loss and the variation of the cross sections for pairs and bremsstrahlung with energy. The results are normalized on the integral spectra of the total electronic component taken from the more recent experimental data and a ratio $\pi^0/\pi^{\pm} = 0.53$ of neutral to charged mesons is obtained. The absolute values of the intensity obtained in this way are not inconsistent with those given by the Bristol group, within the wide limits of the uncertainties actually existing in the knowledge of some processes used in the comparison. *Subject Heading:* **1. Cosmic radiation.**—*Author's abstract.*

7D–9 551.521.6

Chasson, Robert L. (*Univ. of Nebraska, Lincoln*), **Effects of the atmosphere on the penetrating cosmic radiation.** *Physical Review*, 89(6):1225–1256, March 15, **1953.** table, 4 foot-refs. **DWB**—A comparison is made of the results of three independent studies of upper atmosphere influence on the penetrating cosmic radiation. The results of COTTON and CURTIS are in disagreement with those of DUPÉRIER and the author, who agree very closely on the value of the upper-atmospheric temperature coefficient for the hard radiation observed at sea level. The work of COTTON and CURTIS is examined with regard to method of data reduction, whereupon it is suggested that they are possibly in error because of statistical inadequacy of the cosmic ray data and an improper mode of application of meteorological data. *Subject Headings:* **1. Cosmic ray penetration 2. Atmospheric effects on cosmic rays.**—*Author's abstract.*

7D–10 551.594.12:551.521.6

Clay, J., **Ions and condensation nuclei in the atmosphere, balance of ions and value of cosmic radiation at sea level.** *Journal of Atmospheric and Terrestrial Physics*, 3(3):132–140, April **1953.** 6 figs., 4 tables, 12 refs. **MH-BH**—Various measurements of ionic spectrum over the oceans are quoted and it is found that results depend on limiting mobility. Numbers of condensation nuclei and ions counted on voyage from Holland to Indies are tabulated. Over oceans, the main source of ions (1.66/cc/sec in 52°N) is cosmic radiation. Observations in Amsterdam gave (ions/cc/sec): Cosmic radiation 1.66, Gamma radiation of soil 1.70, random 2.3–6.7. (*Same item as* 4.9–254, Sept. 1953, *MAB.*) *Subject Headings:* **1. Cosmic radiation 2. Ionization 3. Amsterdam, Netherlands.**—*C.E.P.B.*

7D–11 551.521.6

†Conversi, M.; Martelli, G. and Rothwell, P., **Sul rapporto tra i numeri di neutroni e di protoni e su alcune proprietà della componente nucleonica a 3500 m s.l.d.m.** [Relation between the number of neutrons and of protons and some properties of the nucleonic component at 3500 m a.s.l.] *Il Nuovo Cimento*, 10(7):898–914, July, **1953.** 3 figs., 5 tables, eqs., 21 refs. English summary p. 914. **DLC**—A fast, thin-walled ionization chamber surrounded with G.M. counters connected to a 22 channel-hodoscope has been used to investigate some properties of the nucleonic component present at 3500 m above sea level. The picture of each nuclear interaction taking place in the chamber (inasmuch as prongs are emitted which cross the counters) is recorded by a typewriter triggered

the hodoscope. The "detectable prongs" are shown to correspond to the "grey tracks" and ower particles" observed in photographic emulsions. Some results of the analysis of more than)00 stars are reported. Good agreement is shown to exist between these results and the phe- enological theories of the nucleonic component. *Subject Headings:* **1. Cosmic radiation 2. Nu- onic component of cosmic rays.**—*From authors' abstract.*

7D–12 551.521.64(98)

Cosmic ray observatory flown to 14,000 feet. *Science News Letter*, 64(6):89, Aug. 8, **1953.** /B—Brief account of the establishment and operation of a station on Mt. Wrangell, Alaska ,000 ft). The research team is supplied from the air. Its primary purpose is the investigation osmic radiation with a view of determining its role in the production of auroras, radio static and gnetic storms. The station is also available for other research. DR. KORFF is in charge of the ject which is sponsored jointly by New York Univ. and the Univ. of Alaska. *Subject Headings:* **Cosmic ray research 2. Mt. Wrangell, Alaska.**—*G.T.*

7D–13 551.521.64:537.5

Cosmic ray research. *Atomics and Atomic Engineering*, London, 4(5):114–118, May, **1953.** gs. **DLC**—The use of large balloons, cloud chambers, emulsions and cosmotrons in attempts at overing the nature and behavior of cosmic rays in the high atmosphere, in the laboratory and mountain stations is reviewed and the equipment illustrated. The work done by the Brookhaven tional Laboratory is given special emphasis. *Subject Heading:* **1. Cosmic ray research.**—*M.R.*

7D–14 551.521.64:537.59

Damm, C. C. (*Brookhaven Natl. Lab., Upton, N. Y.*), **The secondaries of penetrating showers.** *ysical Review*, 89(4):826–831, Feb. 15, **1953.** 4 figs., foot-refs. **DWB**—The momentum ctrum of penetrating shower secondaries at 11,200 ft altitude has been measured by means of the tribution in projected angle of the multiple Coulomb scattering of those particles in a lead plate a cloud chamber. The resulting spectrum is compared to that obtained for the meson secondaries stars in photographic plates exposed at 70,000 ft. For mesons above 500 Mev, the two spectra ncide within the errors. At lower energies, and especially around 100 Mev, a marked difference sts. The respective average energies are also different by a factor of about two. All of these erences appear to result both from selecting particles emitted in the forward direction, and from her energies of the particles producing the primary event in the present experiment. The average imary energy appears to be less than 8 Bev, which is a lower value than one might deduce from latitude effect of penetrating showers. A production of photons in carbon by the penetrating ower secondaries has been observed. Interpreted in terms of π^0 production, this is consistent h the photographic plate work that has suggested inelastic charge exchange scattering. Three ays of neutral V^0 particles observed show that the cross section for V^0 production by the pene- ting shower secondaries is most likely an appreciable fraction of the geometrical cross section. *bject Headings:* **1. Penetrating showers 2. Penetrating shower secondaries.**—*Author's abstract.*

7D–15 551.507.321:551.521.64

Darby, J. F.; Hopper, V. D.; Laby, Jean E. and Wilson, A. R. W., **Flight characteristics of pansible balloons.** *Australian Journal of Physics*, Melbourne, 6(4):471–479, Dec. **1953.** 6 figs., s., 7 eqs. **MH-BH**—An account of work performed by a group engaged in cosmic ray research the Univ. of Melbourne. The factors governing the rate of rise, the excess pressure, the height stabilization of rubber balloons are outlined in theory and examples given from practice. The rpose of the studies was to find a method of using the cheap (compared to plastic balloons) rubber lloons to carry a heavy load to a high altitude (>80,000 ft), to have the instruments exposed for a g period at that altitude and, finally, to be able to track the balloon to its landing place. Several thods are suggested, but the most successful was that which uses a release valve operated by a ing attached across its diameter and a clock which closes the valve after a certain time, allowing balloon to rise again to its bursting point. By using aluminum markers for tracking, recovery s raised to 87% from 25%. *Subject Headings:* **1. Balloon research 2. Balloon performance Cosmic ray research 4. Melbourne, Australia.**—*M.R.*

7D–16 551.521.64

Daudin, Alice and Daudin, Jean, **Effets atmosphériques sur les gerbes d'Auger.** [Atmospheric ects on Auger showers.] *Journal of Atmospheric and Terrestrial Physics*, 3(5):245–257, June **1953.** ables, 21 refs., 7 eqs. English summary p. 245. Also their: **Les gerbes d'Auger dans l'atmos- ère.** [Auger showers in the atmosphere.] *Journal de Physique et le Radium*, Paris, 14(3):169– 4, March **1953.** fig., table, 11 refs. Also their: **Les gerbes d'Auger et la densité de la haute nosphère.** [Auger showers and the density of the upper atmosphere.] *Académie des Sciences, ris, Comptes Rendus*, 236(13):1352–1354, March 30, **1953.** 2 tables, refs. **DLC**—At Pic du

Midi (2860 m) air showers have been investigated using banks of counters separated by 5 and 80 m. Results are tabulated. Pressure effect is −9% per cm Hg. A temperature effect is found due to effect on air density at 300 mb level. The effect of air density is discussed in detail. (For full abstracts, *see items* 5.7–101 and 102, July 1954, *MAB.*) *Subject Headings:* **1. Cosmic ray showers 2. Auger showers 3. Pic du Midi, France.**—*C.E.P.B.*

7D–17 551.521.64:551.507.31

Dawton, D. I. and Elliot, H., **Day and night measurements of the total cosmic ray intensity at balloon altitudes.** *Journal of Atmospheric and Terrestrial Physics*, 3(4):217–222, May 19[illegible] 2 figs., table, 12 refs. **DWB**—Eleven day and 7 night balloon flights to 22–34 km from Manchester March 17–July 23, 1952, carried simple apparatus including a single counter. Counts at maximum exceeded 3000/min, with marked day-day fluctuations but no systematic difference was found between day and night. (*Same item as* 4.11–152, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cosmic ray measurement 2. Manchester, Eng.**—*C.E.P.B.*

7D–18 551.521.[illegible]

Dawton, D. I. and Elliot, H., **Time variations of the soft component of the cosmic radiation.** *Journal of Atmospheric and Terrestrial Physics*, 3(6):295–300, July 1953. 6 figs., 2 tables, 4 refs. **MH-BH**—Soft component of cosmic ray flux, and meson intensity under 10 cm lead, at sea level in Manchester showed large negative correlation with surface pressure and small negative with heights of pressure levels (temperature effect). The latter was greatest at 200 mb. Seasonal variation in soft component (maximum winter) is smaller and less regular than that of mesons, but diurnal variation (maximum noon) is greater; these effects are related to temperature variations in atmosphere. *Subject Headings:* **1. Cosmic ray variations 2. Manchester, Eng.**—*C.E.P.B.*

7D–19 551.521.[illegible]

Dilworth, C. C. and Goldsack, S. J., **The spectra and sign distributions of particles from cosmic ray stars at 2860 metres altitude.** *Il Nuovo Cimento*, 10(7):926–936, July 1, 1953. 9 figs., 2 tables, 8 refs., 4 eqs. Italian summary p. 936. **DLC**—Measurements have been made on mesons and protons emitted from stars recorded at 2800 m and compared with published results for balloon altitudes. It appears that, while the multiplicity of showers is greatly reduced at the lower altitude, the normalized energy spectra are closely similar. The determination of the sign of the charge of particles leads to a preliminary determination of the positive-negative ratio of mesons produced at this altitude, and of πp's primary and secondary to stars. *Subject Headings:* **1. Cosmic ray stars 2. Cosmic ray mesons 3. Protons.**—*Authors' abstract.*

7D–20 551.521.[illegible]

Dungey, J. W. (*Univ. of Sydney, New South Wales, Australia*), **Origin of cosmic rays.** *Physical Review*, 91(3):766, Aug. 1, 1953. 6 foot-refs. **DWB**—Theories of cosmic ray origin are numerous but the most popular group of theories assumes a magnetic field varying with time (i.e., FERMI turbulent motion theory whereby particles have a slow gain of energy). A special case of this would be where the motion of the field is uniform but the field itself nonuniform. A combination of the two processes could result in the "Betatron process" of FERMI and others. This special case explained mathematically and other theories mentioned. *Subject Headings:* **1. Cosmic ray origin 2. Betatron processes 3. Fermi theory.**—*M.R.*

7D–21 551.521.64:537.591

El-Mofty, Osman (*Dept. of Physics, Calif. Univ. at Berkeley*), **Multiple cores in air showers.** *Physical Review*, 92(2):461–463, Oct. 15, 1953. fig., 2 tables, 12 refs., eq. **DWB**—Multiple cores in cosmic ray air showers are difficult to observe because of the overlapping of the cores. After transition to equilibrium with water the cores are much smaller and readily identified. Decoherence measurements of the coincidences between pulses in ionization chambers have been made for depths in water from 0 to 3 m and with separation of the chambers up to 6 m. The decoherence measurements are consistent with an average air shower at 9000 ft which has about 20 cores within a distance of about 5 m from the shower's center. *Subject Heading:* **1. Cosmic ray showers.**—*Author's abstract.*

7D–22 551.521.64(235.2)

Eugster, A. and Hintermann, K., **Höhenstrahlungen mit Photoplatten gelegentlich der schweizerischen Himalajaexpedition 1952.** [High-level radiation with photo plates on the occasion of the Swiss Himalaya expedition 1952.] *Experientia*, 9(8):287, Aug. 15, 1953. 2 refs. English summary p. 287. **DLC**—Plates exposed at 8000 m from Aug. 5, 1952–Jan. 1, 1953, showed 204 stars/cm. As a loss of 10–20% could be expected by fading this agrees well with figure of 298 calculated from other measurements up to 5000 and above 25,000 m. *Subject Headings:* **1. Cosmic ray stars 2. Himalayas. I. Swiss Himalaya Expedition, 1952.**—*C.E.P.B.*

7D–23 551.521.64:577

Eugster, Jakob, **Die Erforschung der biologischen Wirkung der kosmischen Strahlung.** [The estigation of the biological effect of cosmic radiation.] *Naturwissenschaftliche Rundschau*, :281–283, July **1953.** table, 15 refs. **DWB**—The effects of cosmic radiation in shortening life in causing mutations, and the possibility of controlled experiments, are discussed. Experiments h *Artemia* eggs show two types of effect, one harmless, even helpful in life processes, and the er harmful to cells, especially at great heights, due to heavy particles which cause tumors and lionization chemical effects. (*Same item as* 4.11–153, Nov. 1953, *MAB.*) *Subject Heading:* **Biological effects of cosmic rays.**—*C.E.P.B.*

7D–24 551.521.64:551.510.41:551.510.536

Fireman, E. L. (*Brookhaven National Lab., Upton, N. Y.*), **Measurement of the (n, H^3) cross tion in nitrogen and its relationship to the tritium production in the atmosphere.** *Physical view*, 91(4):922–926, Aug. 15, **1953.** 2 tables, 24 foot-refs., 9 eqs. **DWB**—Nitrogen gas is diated by fast neutrons from a U^{235} fission plate and tritium is produced. The tritium is identified l counted by two different methods: (1) The gas is put into a cloud chamber where the H^3 electrons identified by their range and counted; (2) hydrogen is separated from nitrogen by its passage ough palladium and is then counted in a Geiger counter. The average cross section for fission utrons with energy sufficient to make the reaction proceed is [4.4 Mev is $(11 \pm 2) \times 10^{-27}$ cm^2]. is cross section combined with cosmic ray neutron data gives an H^3 production rate of between 0/cm^2 sec and 0.20/cm^2 sec averaged over the earth. Cosmic ray stars eject H^3 at a rate estimated ween 0.30/cm^2 sec and 0.70/cm^2 sec. These two processes maintain a world reservoir of 50 to 110 lion curies of H^3. This H^3 production leads to a mean escape time of He^3 from the atmosphere about 5 million years. This is consistent with a temperature at the base of the exosphere of 00°K. *Subject Headings:* **1. Tritium 2. Exosphere 3. Cosmic radiation.**—*Author's abstract.*

7D–25 551.521.64

Froehlich, Fritz E. and Sitte, Kurt, **The mean free path for shower production.** Syracuse iv., Dept. of Physics, Contract AF 19(604)-68, Scientific Report No. 1, [**1953?**] 22 p. 5 figs., ables, 20 refs. **MH-BH**—Results of experiment at Echo Lake, Col. (3260 m altitude) to deter- ne difference in mean free path for shower production by protons and π-mesons of very high energy. erage energy of primaries was estimated at 5.3 Bev (low-) 8.3 Bev (medium-) and 16–20 Bev gh-energy group). Rates of two latter groups when plotted on semi-log paper do not make a aight line, indicating that mean free paths of the two components are not identical. *Subject adings:* **1. Mean free path of cosmic rays 2. Cosmic ray shower production 3. Echo Lake, l.**—*From authors' abstract.*

7D–26 551.521.64:551.521.4

Galbraith, W. and Jelley, J. V., **Light pulses from the night sky associated with cosmic rays.** *ture*, London, 171(4347):349–350, Feb. 21, **1953.** fig., 3 refs. **DWB**—The photomultiplier with thode at focus of a parabolic mirror, at center of 16 Geiger-Müller counters, recorded light pulses, arge fraction of which were directly correlated with cosmic radiations. *Subject Headings:* **1. Cosmic diation 2. Night airglow.**—*C.E.P.B.*

7D–27 551.521.64

Gaspa, P., **Les rayons cosmiques, effets physio-pathologiques sur l'homme.** [Physiopatho- gical effects of cosmic rays on man.] *La Météorologie*, 4th Ser., No. 32:261–271, Oct./Dec. **1953.** ., table, 7 refs. English and Spanish summaries p. 261. **MH-BH**—Brief history of discovery of smic rays and the progress in cosmic ray research, with emphasis on the research on possible ects on man, especially at high altitudes. Continual exposure to heavy primary cosmic rays for month 15 hrs a day at 23 km shown to be equivalent to a dangerous concentration of 1 microgram radium which could produce chronic disorder. However, pilots would seldom be exposed at ch heights for such periods. Biological effects on animals indicate that sudden death would not ely occur, but harmful cumulative effects might result from repeated exposure. Effects on rvous tissue, eyes or in producing cancer or sterility are suggested, but not certain to be harmful. nly actual experience at high altitudes can give the answer. *Subject Headings:* **1. Biological effects cosmic radiation 2. Radiation biometeorology 3. Cosmic ray discovery.**—*M.R.*

7D–28 551.521.64

George, E. P., **Cosmic radiation.** *Science News*, 27:30–45, **1953.** 2 figs., table. **DWB**—A cid account of the primary ("cosmic") and secondary ("nuclear") radiation in the atmosphere. easurement techniques, chemical analysis and energy spectrum of primary particles and their stribution in time and space are described, including relations to sunspots and magnetic storms,

Theories of origin are discussed, and effect of cosmic radiation in estimates of age of the earth con sidered. (*Same item as* 4.11–154, Nov. 1953, *MAB.*) *Subject Heading:* **1. Cosmic radiation.**—*C.E.P.B.*

7D–29 551.521.6

Gottstein, K., **Zur Aufspaltung der schweren Kerne in der kosmischen Strahlung.** [On th splitting up of heavy nuclei in cosmic radiation.] *Naturwissenschaften*, 40(3):104–105, Feb. 1953 3 tables, 7 refs. **DWB**—Charge spectrum of 65 heavy particles is compared with American measure ments and discussed. *Subject Heading:* **1. Cosmic ray showers.**—*C.E.P.B.*

7D–30 551.521.64:537.5

Greisen, K. and Walker, W. D. (*Cornell Univ., Ithaca, N. Y.*), **Ratio of neutral to charged par ticles in the nuclear interacting component of cosmic rays.** *Physical Review*, 90(5):915–920, June 1 **1953.** 4 figs., 3 tables, foot-refs. **DWB**—The ratio of neutral to charged primaries of nuclea interactions having a median primary energy around 10^{11} ev has been measured at 3250 m elevation the result being $N/C \cong \frac{3}{4}$. This value indicates a high degree of elasticity in the nuclear collision from which nucleons of 10^{11}-ev emerge. *Subject Heading:* **1. Cosmic ray intensity.**—*Author abstract.*

7D–31 551.521.6

Hayakawa, Saito and Kobayashi, Shinsaku (*both, Physics Dept., Osaka Univ.*), **Propagatio of the cosmic radiation through interstellar space.** *Journal of Geomagnetism and Geoelectricity* Kyoto, 5(3):83–93, Nov. **1953.** 21 refs., numerous eqs. **DLC**—Various theories on the origi of the cosmic radiation are critically surveyed. Expected phenomena resulting from the galacti origin theory in which charged cosmic rays are trapped by the galactic magnetic field are discusse with special regard to the secondaries due to the collisions with interstellar hydrogen. Electron through the decay process $\pi \rightarrow \mu \rightarrow e$ are then expected to amount 3–9% of the total intensity, depend ing upon the magnetic field strength in our galaxy. An alternative hypothesis that the cosmi radiation propagates in a straight way is also examined. It is proposed that this may be tested b observing primary photons, resulting from the decay process $\pi^0 \rightarrow 2\gamma$, which could be several percen of the total radiation at low latitudes. *Subject Headings:* **1. Cosmic ray origin 2. Cosmic ra theory.**—*Authors' abstract.*

7D–32 551.521.64:0

†Heisenberg, Werner (ed.), **Kosmische Strahlung.** [Cosmic radiation.] 2d ed. Berlin Springer Verlag, **1953.** 620 p. 256 figs., tables, numerous eqs., bibliog. p. 587–611. **DLC**—A remarkable wealth of information with a thousand or more references to world literature has bee gathered together by a team of distinguished German authors in this volume containing lecture delivered at the Max-Plank-Institut at Göttingen and covering the entire field of cosmic radiatio research. Over 40 articles, many of them highly technical, are grouped in sections on (1) origin o cosmic radiation, (2) nucleons and π mesons, (3) μ mesons, (4) the electronic and light-quantum components, (5) interactions between the various components, and an appendix. The papers dea mostly with the physics of cosmic radiation processes; methods of measurement usually bein discussed without detailed description of instrumentation. Convenient access to topics of interes to the individual reader is provided by an extensive subject index. *Subject Headings:* **1. Cosmi radiation 2. Cosmic ray symposia.**—*G.T.*

7D–33 551.521.6

Höringer, Cl., **Aussergewöhnliche Schwankung der Höhenstrahlung am 7.4.1953.** [An unusua variation of cosmic radiation on April 7, 1953.] *Zeitschrift für Meteorologie*, 7(7):220–221, July **1953** ref. **DWB**—A description of the apparatus for recording cosmic radiation at the Potsdam Observa tory is given. The cosmic shower showed a maximum variation (over a period of 2 years) from normal of about 16 coincidences/min to 84 coincidences/min from 9.00 to 9.02 Central Europea time. It was accompanied by hail. The barometric pressure increased by 16% and the atmospheri potential gradient was above the value at the beginning of measurement. Also air disturbance at the frequency of 27 kHz measured above the usually observed. *Subject Headings:* **1. Cosmi ray variations 2. Berlin, Germany.**—*I.L.D.*

7D–34 551.521.6

Hooper, John E. (*H. H. Wills Physical Lab., Bristol Univ.*), **The intensity of the photon com ponent at 70,000 feet altitude.** *Philosophical Magazine*, London, 44(335):871–876, Aug. **1953** fig., 12 refs., eq. **DWB**—The intensity of high energy λ-rays traversing photographic emulsion can be determined by measurements on the electron-pairs resulting from the materialization of th quanta. A difficulty in the practical application of the method arises from the failure to observ

ort or steeply dipping tracks. A method for correcting for unobserved tracks of electron-pairs discussed, and is used to obtain an estimate of the vertical intensity of the photon component of e cosmic radiation at 54°N and at an altitude of 70,000 ft. It is convenient to express the intensity terms of the ratio of the number of quanta to the number of high energy nucleons at the same titude. A value of 2.88±0.26 for this ratio has been found. The result is in satisfactory agreement with that calculated on the basis of reasonable assumptions about the energy and frequency production of π^0-mesons in nuclear collisions in the atmosphere. *Subject Headings:* **1. Cosmic y photons 2. Cosmic ray intensity.**—*Author's abstract.*

7D–35 53(09) 551.521.64

Hull, Gordon Ferrie, **Experimental discoveries announced at the meeting of the American hysical Society fifty years ago.** *Scientific Monthly*, 77(1):13–18, July **1953.** 9 refs. **DLC**—The ree outstanding discoveries announced at the Washington Meeting of 1902–3 (Christmas week) ere the discovery of the pressure of light by E. F. NICHOLS of Dartmouth, the identification of the lpha particle by RUTHERFORD and the discovery of cosmic rays by RUTHERFORD and COOKE at IcGill Univ. RUTHERFORD recognized that the penetrating radiation would go through a 5 ton ad shield, and that it came from all directions except the earth. Later work by WRIGHT, GOCKEL, ESS, MILLIKAN and COMPTON is reviewed. *Subject Headings:* **1. History of physics 2. Cosmic ray iscovery 3. Cosmic ray research.**—*M.R.*

7D–36 551.521.64:551.510.535:523.74

*Japan. Science Council. Ionosphere Research Committee, **Catalogue of disturbances in onosphere, geomagnetic field, field intensity of radio wave, cosmic ray, solar phenomena and other elated phenomena.** No. 1, Aug. 3, **1949–** Last seen, No. 17, June 29/30, July 23/24, **1953.** enrely data. **DWB**—Each of these reports contains ionospheric, geomagnetic, radio, cosmic ray and olar data connected with one or more selected disturbances and observed at various stations in apan. The cosmic ray intensity curves represent data obtained at Nagoya, Itabashi and Mabashi, apan, by means of counter telescopes or ionization chambers. (For abstract on Report No. 10, ee 6D–71, April 1955, *MAB.*) *Subject Headings:* **1. Cosmic ray data 2. Solar phenomena 3. Ionospheric disturbances 4. Magnetic storms 5. Japan.**—*G.T.*

7D–37 551.508.25:551.521.64:551.507.321.2

†Jenkins, James Farris, Jr., **Experimental determination of the cross section for multiple particle roduction in carbon by cosmic rays at balloon altitudes.** Thesis (Ph.D.)—Univ. of Maryland, **953.** 128 p. figs. (incl. photos), numerous refs., eqs. **DLC**—Data on cosmic ray intensity and osmic ray bursts in carbon targets as well as atmospheric pressure and temperature values were btained during two flights (Jan. and Feb. 1952) in which skyhook balloons carried equipment up to 00,000 ft. The cosmic ray telescope and burst detector equipment is described in detail. Pressure urves of total cosmic ray intensity and of burst rate are presented. *Subject Headings:* **1. Cosmic ay instruments 2. Pressure effects on cosmic rays.**—*G.T.*

7D–38 551.521.64:551.583.2

Kulp, Laurence J. and Volchok, Herbert L., (*Columbia Univ., N. Y. City*), **Constancy of cosmic-ay flux over the past 30,000 years.** *Physical Review*, N. Y., 90(4):713–714, May 15, **1953.** figs., refs. **DLC**—Samples of deep sea bottom sediments were analyzed by the carbon-14 and ionium ethods for age at various depths, and the results plotted against each other. The straight line elationship indicates that there has been little change in cosmic ray flux into the atmosphere during ne past 35,000 years (not over 10–20% variation). A parallel curve shows the relationship which ould have existed if cosmic ray flux during the ice age were only ½ what it is at present. This urve is well outside the range of possible error of the C^{22} method. Larger samples will be taken o increase accuracy. *Subject Headings:* **1. Cosmic radiation 2. Climatic changes 3. Ice ages . Radiocarbon dating.**—*M.R.*

7D–39 551.521.64

Machado, Emilio A. M. (*Argentine Nat. Met. Ser.*), **Los procesos estocásticos de la radiación ósmica.** [The stochastic processes of cosmic radiation.] *Meteoros*, Buenos Aires, 3(2/3):174–193, pril/Sept. **1953.** 8 refs., numerous eqs. French summary p. 174. **DWB**—This review includes discussion of the theorems of KOLMOGOROV and FELLER, and the MARKOV Series on the basis of hich the general theories of uni- and multi-dimensional stochastic processes are developed, and of he stochastic models of BHABHA and HEITLER, FURRY and POLYA which constitute special applications to the theory of cosmic radiation. *Subject Headings:* **1. Cosmic radiation 2. Stochastic rocesses.**—*I.L.D.*

7D–40 551.521.64:551.524.7

Maeda, K., **Remarks on annual and diurnal variation of cosmic ray intensity.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 5(3):105–108, Nov. 1953. 4 figs., 2 tables, 5 refs., eqs. **DLC**—The temperature effect on cosmic ray intensity is demonstrated by taking the difference in height between the 100 and 200 mb level as an index of temperature changes and showing graphically the similarity between the annual curve (inverted) of temperature at 200 mb and 100–200 mb, and the diurnal variation based on bi-hourly soundings at Tateno, Japan; and the latitude effects by cosmic ray data for Huancayo (12°S), Cheltenham (39°N) and Godhaven (69°N) compared with aerological data for San Juan (17°N), Washington (39°N) and Thule (77°N). Table shows cosmic ray intensity and 100–200 mb temperature amplitudes and calculated temperature coefficients. *Subject Headings:* **1. Temperature effects on cosmic rays 2. Latitude effects on cosmic rays 3. Cosmic ray diurnal variations 4. Cosmic ray annual variations.**—*M.R.*

7D–41 551.521.64

Messel, H. (*Univ. of Chicago*) and Potts, R. B. (*Univ. of Adelaide, South Australia*), **Longitudinal development of extensive air showers.** *Il Nuovo Cimento*, Bologna, 10(6):754–778, June 1, 1953. 7 figs., 7 tables, foot-refs., eqs. Italian summary p. 778. **DLC**—A theory of cosmic ray showers is presented which embraces the following features: it is assumed that the primary radiation consists of nucleons; the nucleons generate the pion component by collision with nuclei; the charged pions decay into muons; the neutral pions decay into photons which initiate the soft component. Detailed numerical results are given for the average numbers (or intensities) of the various components at different depths in the atmosphere and for different energy ranges (only particles with energies >10 GeV are considered in this paper). The theory predicts that the charged pion and soft components have maxima at about 125 gm/cm² and that the number of (high energy) muons increases with depth, showing no maximum. The radiation is predominantly muons up to about 8000 metres and the number of high energy charged pions at sea level is much greater than the number of high energy nucleons. This latter feature provides a test of the assumption that the high energy pions do not interact with nuclei in the atmosphere. It is concluded that high energy charged pions must interact with nuclei and that their interaction mean free path is longer than that for nucleons. The *total meson* component and the total radiation follow very closely a power law with the same exponent as that assumed for the primary nucleons. *Subject Heading:* **1. Cosmic ray showers.**—*Authors' abstract.*

7D–42 551.521.64

Miyazaki, Yokio, **On the long term variation of cosmic-ray intensity.** *Japan. Science Council Ionosphere Research Committee, Report of Ionosphere in Japan*, 7(4):157, Dec. 1953. **DWB**—Brief note reporting research (still in progress) on long-term variations of cosmic ray intensity observed at Huancayo, Cheltenham and Godhavn (1936–1950). Preliminary results indicate that "long term variation of cosmic rays is due partly to the change of the primary spectrum itself." *Subject Heading:* **1. Cosmic ray variations.**—*G.T.*

7D–43 551.521.4:537.591.1

†Morewitz, H. A. and Shamos, M. H. (*both, Washington Square College, N. Y. Univ.*), **The variation of the ratio of positive to negative cosmic-ray μ mesons with momentum and altitude.** *Physical Review*, 92(1):134–144, Oct. 1, 1953. 6 figs., 4 tables, 90 foot-refs., 2 eqs. **DWB**—I. The mean lifetime of $\mu^{\pm}$ mesons in carbon and sulfur has been measured by the delayed coincidence technique. Data for decay times 72μ sec were analyzed by the statistical method of PEIERLS and yield $v_s{}^+ = 2.09 \pm 0.05\mu$ sec for the mean life of the μ^+ meson in sulfur and $v_s{}^- = 1.92 \pm 0.04\mu$ sec for the mean lifetime of the μ^- meson in carbon $v_s{}^+$ compares favorably with values found in material of low atomic number, but there appears to be a significant difference between these values and those obtained in high Z materials. Assuming a Z^4 dependent capture probability for μ^- mesons, $v_c{}^-$ is compatible with other lifetimes determined in materials of higher Z. II. The integral time distributions of the delayed coincidences obtained above were extrapolated to zero delay time and allowance made for those μ^- mesons which are captured in carbon. These data were used to obtain the μ^+/μ^- ratio at a momentum of 325 ± 70 Mev/c at sea level: $\mu^+/\mu^- = 1.06 \pm 0.03$. This ratio is compared with other experiments (which also provide good identification of the μ mesons) by plotting all ratios as a function of momentum at the top of the atmosphere (TOA). The best fit to the experimental points is given by the exponential expression

$$P = P_0 \exp\ [\mu^+/\mu^-/K],$$

where $P < 4$ Bev/c(TOA), $P_0 \simeq 0.165$ Bev/c(TOA), and $K \simeq 0.38$. The decrease of the μ^+/μ^- ratio with increasing altitude appears to be well established, although the exact values of P and K are uncertain. *Subject Headings:* **1. Cosmic ray mesons.**—*Authors' abstract.*

7D–44 551.521.64:551.508.25

Murty, D. S. R. (*Osmania Univ., Hyderabad*), **East-west asymmetry of cosmic rays.** *Indian Academy of Sciences, Bangalore, Proceedings*, Sec. A, 37(2):317–320, Feb. **1953.** fig., table, 13 refs. Also his: **Fine structure in the directional intensity of cosmic rays at Hyderabad.** *Ibid.*, 38(6):516–521, Dec. **1953.** fig., table, refs. **DLC**—Triple coincidence counter telescopes were used to study the east-west asymmetry of cosmic rays at Hyderabad, India (7.7°N lat.; 1800 ft alt.). The asymmetry rises to a maximum of 12.3% at a zenith angle of 43° and falls off at higher angles. Curves for east and west azimuth show a fine structure which was not predicted for such low geomagnetic latitudes although it was found at Milan, in Missouri and Mexico and even at Calcutta (12°N) and Lahore (22°N). *Subject Headings:* **1. Cosmic ray instruments 2. Cosmic ray asymmetry 3. Hyderabad, India.**—*M.R.*

7D–45 551.521.64(98)

The Navy hunts cosmic rays. *Popular Mechanics Magazine*, Chicago, 99(3):103–105, 266, 268, 270, March **1953.** photos, illus (in color) incl. cover. **DWB**—Popular account of U.S.N. "East-Wind's" polar expedition. Purpose of the trip was the measurement of cosmic rays by balloon-borne equipment and by Deacon rockets carried up to a considerable height by balloons and automatically launched from there. Data obtained are discussed in general terms. (*Same item as* 1.1–168, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cosmic ray measurement 2. Arctic expeditions 3. Arctic.**—*G.T.*

7D–46 551.521.64

*Neher, Hewey Victor; Peterson, V. Z. and Stern, E. A., **Fluctuation and latitude effect of cosmic rays at high altitudes and latitudes.** Pasadena, Calif., California Institute of Technology, Norman Bridge Lab. of Physics, Jan. **1953.** 45 p. 20 figs. (1 fold.) **DWB**—Simultaneous flights were made (for purpose of studying the time and latitude fluctuations of cosmic rays at high altitudes) at Bismarck, N. Dak. and on planes going from Boston to Thule (4 flights) and at Thule, Greenland (5 flights), near the geomagnetic pole. A special radiosonde ionization chamber was used and 28 successful flights made in all. It was found that at 90,000 ft fluctuations of 10% in primary radiation would occur in a few days, and would occur simultaneously at both stations, and in both high and low momentum particles (1.5 to 15 Bev/c). The high level fluctuations correlated highly with fluctuations in neutron and meson components at the ground. Only important geomagnetic effect was in total ionization at 30 to 50 thousand ft (negative with 1 gt) and positive latitude effect above 50,000 ft at high latitudes. A wealth of data is given in table, charts and graphs. (*Same item as* 5.5–152, May 1955, *MAB.*) *Subject Headings:* **1. Latitude effects on cosmic rays 2. Cosmic ray variations 3. Cosmic ray measurement 4. Bismarck, N. D. 5. Thule, Greenland.**—*M.R.*

7D–47 551.521.64:551.510.535:551.507.362(02)

*†Newell, Homer E., Jr. (*Naval Res. Lab., Wash.*), **High altitude rocket research.** New York, Academic Press, **1953.** 298 p. 93 figs., 37 tables, numerous refs. Price: $7.50. **DLC**—Ch. 9, Cosmic rays, includes a brief history of cosmic ray discovery, and sections on the meaning of cosmic ray intensity; means for detecting and measuring cosmic rays; geometric factors in cosmic ray measurements; the role of rockets in cosmic ray research; cosmic ray intensity above the atmosphere and its variation with direction; composition of primary cosmic rays; and results of rocket measurements of cosmic rays. Fifty-four references are attached to this chapter. (For fuller abstract, see 5.5–7, May 1954, *MAB.*) *Subject Headings:* **1. Rocket measurement of cosmic rays 2. Cosmic radiation.**—*G.T.*

7D–48 551.521.64:551.524:551.543

Olbert, Stanislaw (*Dept. of Physics and Lab. for Nuclear Science, M. I. T., Cambridge*), **Atmospheric effects on cosmic-ray intensity near sea level.** *Physical Review*, 92(2):454–461, Oct. 15, **1953.** 7 figs., 11 foot-refs., 37 eqs. **DWB**—The effects of atmospheric temperature and pressure on the μ-meson intensity are studied theoretically for locations near sea level. The analysis is based on a uni-dimensional equation for the vertical differential intensity of μ mesons, studied originally by SANDS. The treatment is rigorous in the sense that it includes the continuous production as well as the ionization losses of μ mesons in the atmosphere. With the help of a newly derived range spectrum of μ mesons at production and the exact expression for the survival probability of μ mesons, a three-term regression formula for the relative changes of the μ-meson intensity is derived and discussed in detail. According to this formula, the relative intensity changes are correlated not only with production height and the ground pressure (a customarily employed two-term correlation) but also with the average tropospheric temperature. This additional correlation, resulting from the ionization losses of μ mesons in the air, seems to remove some apparent difficulties in the interpretation of experimental data. In particular, it seems to explain the discrepancies found in the decay coeffi-

7D–40 551.521.64:551.524.7

Maeda, K., **Remarks on annual and diurnal variation of cosmic ray intensity.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 5(3):105–108, Nov. 1953. 4 figs., 2 tables, 5 refs., eqs. **DLC**—The temperature effect on cosmic ray intensity is demonstrated by taking the difference in height between the 100 and 200 mb level as an index of temperature changes and showing graphically the similarity between the annual curve (inverted) of temperature at 200 mb and 100–200 mb, and the diurnal variation based on bi-hourly soundings at Tateno, Japan; and the latitude effects by cosmic ray data for Huancayo (12°S), Cheltenham (39°N) and Godhaven (69°N) compared with aerological data for San Juan (17°N), Washington (39°N) and Thule (77°N). Table shows cosmic ray intensity and 100–200 mb temperature amplitudes and calculated temperature coefficients. *Subject Headings:* **1. Temperature effects on cosmic rays 2. Latitude effects on cosmic rays 3. Cosmic ray diurnal variations 4. Cosmic ray annual variations.**—*M.R.*

7D–41 551.521.64

Messel, H. (*Univ. of Chicago*) and Potts, R. B. (*Univ. of Adelaide, South Australia*), **Longitudinal development of extensive air showers.** *Il Nuovo Cimento*, Bologna, 10(6):754–778, June 1, 1953. 7 figs., 7 tables, foot-refs., eqs. Italian summary p. 778. **DLC**—A theory of cosmic ray showers is presented which embraces the following features: it is assumed that the primary radiation consists of nucleons; the nucleons generate the pion component by collision with nuclei; the charged pions decay into muons; the neutral pions decay into photons which initiate the soft component. Detailed numerical results are given for the average numbers (or intensities) of the various components at different depths in the atmosphere and for different energy ranges (only particles with energies >10 GeV are considered in this paper). The theory predicts that the charged pion and soft components have maxima at about 125 gm/cm² and that the number of (high energy) muons increases with depth, showing no maximum. The radiation is predominantly muons up to about 8000 metres and the number of high energy charged pions at sea level is much greater than the number of high energy nucleons. This latter feature provides a test of the assumption that the high energy pions do not interact with nuclei in the atmosphere. It is concluded that high energy charged pions must interact with nuclei and that their interaction mean free path is longer than that for nucleons. The *total meson* component and the total radiation follow very closely a power law with the same exponent as that assumed for the primary nucleons. *Subject Heading:* **1. Cosmic ray showers.**—*Authors' abstract.*

7D–42 551.521.64

Miyazaki, Yokio, **On the long term variation of cosmic-ray intensity.** *Japan. Science Council Ionosphere Research Committee, Report of Ionosphere in Japan*, 7(4):157, Dec. 1953. **DWB**—Brief note reporting research (still in progress) on long-term variations of cosmic ray intensity observed at Huancayo, Cheltenham and Godhavn (1936–1950). Preliminary results indicate that "long term variation of cosmic rays is due partly to the change of the primary spectrum itself." *Subject Heading:* **1. Cosmic ray variations.**—*G.T.*

7D–43 551.521.4:537.591.1

†Morewitz, H. A. and Shamos, M. H. (*both, Washington Square College, N. Y. Univ.*), **The variation of the ratio of positive to negative cosmic-ray μ mesons with momentum and altitude.** *Physical Review*, 92(1):134–144, Oct. 1, 1953. 6 figs., 4 tables, 90 foot-refs., 2 eqs. **DWB**—I. The mean lifetime of $\mu^{\pm}$ mesons in carbon and sulfur has been measured by the delayed coincidence technique. Data for decay times $7{-}2\mu$ sec were analyzed by the statistical method of Peierls and yield $v_s{}^{+}=2.09\pm0.05\mu$ sec for the mean life of the μ^{+} meson in sulfur and $v_s{}^{-}=1.92\pm0.04\mu$ sec for the mean lifetime of the μ^{-} meson in carbon $v_s{}^{+}$ compares favorably with values found in material of low atomic number, but there appears to be a significant difference between these values and those obtained in high Z materials. Assuming a Z^4 dependent capture probability for μ^{-} mesons, $v_c{}^{-}$ is compatible with other lifetimes determined in materials of higher Z. II. The integral time distributions of the delayed coincidences obtained above were extrapolated to zero delay time and allowance made for those μ^{-} mesons which are captured in carbon. These data were used to obtain the μ^{+}/μ^{-} ratio at a momentum of 325 ± 70 Mev/c at sea level: $\mu^{+}/\mu^{-}=1.06\pm0.03$. This ratio is compared with other experiments (which also provide good identification of the μ mesons) by plotting all ratios as a function of momentum at the top of the atmosphere (TOA). The best fit to the experimental points is given by the exponential expression

$$P=P_0 \exp\ [\mu^{+}/\mu^{-}/K],$$

where $P<4$ Bev/c(TOA), $P_0\simeq0.165$ Bev/c(TOA), and $K\simeq0.38$. The decrease of the μ^{+}/μ^{-} ratio with increasing altitude appears to be well established, although the exact values of P and K are uncertain. *Subject Headings:* **1. Cosmic ray mesons.**—*Authors' abstract.*

7D–44 551.521.64:551.508.25

Murty, D. S. R. (*Osmania Univ., Hyderabad*), **East-west asymmetry of cosmic rays.** *Indian Academy of Sciences, Bangalore, Proceedings*, Sec. A, 37(2):317–320, Feb. **1953.** fig., table, 13 refs. Also his: **Fine structure in the directional intensity of cosmic rays at Hyderabad.** *Ibid.*, 38(6):516–521, Dec. **1953.** fig., table, refs. **DLC**—Triple coincidence counter telescopes were used to study the east-west asymmetry of cosmic rays at Hyderabad, India (7.7°N lat.; 1800 ft alt.). The asymmetry rises to a maximum of 12.3% at a zenith angle of 43° and falls off at higher angles. Curves for east and west azimuth show a fine structure which was not predicted for such low geomagnetic latitudes although it was found at Milan, in Missouri and Mexico and even at Calcutta (12°N) and Lahore (22°N). *Subject Headings:* **1. Cosmic ray instruments 2. Cosmic ray asymmetry 3. Hyderabad, India.**—*M.R.*

7D–45 551.521.64(98)

The Navy hunts cosmic rays. *Popular Mechanics Magazine*, Chicago, 99(3):103–105, 266, 268, 270, March **1953.** photos, illus (in color) incl. cover. **DWB**—Popular account of U.S.N. "Eastwind's" polar expedition. Purpose of the trip was the measurement of cosmic rays by balloon-borne equipment and by Deacon rockets carried up to a considerable height by balloons and automatically launched from there. Data obtained are discussed in general terms. (*Same item as* 1.1–168, Jan. 1954, *MAB.*) *Subject Headings:* **1. Cosmic ray measurement 2. Arctic expeditions 3. Arctic.**—*G.T.*

7D–46 551.521.64

*Neher, Hewey Victor; Peterson, V. Z. and Stern, E. A., **Fluctuation and latitude effect of cosmic rays at high altitudes and latitudes.** Pasadena, Calif., California Institute of Technology, Norman Bridge Lab. of Physics, Jan. **1953.** 45 p. 20 figs. (1 fold.) **DWB**—Simultaneous flights were made (for purpose of studying the time and latitude fluctuations of cosmic rays at high altitudes) at Bismarck, N. Dak. and on planes going from Boston to Thule (4 flights) and at Thule, Greenland (5 flights), near the geomagnetic pole. A special radiosonde ionization chamber was used and 28 successful flights made in all. It was found that at 90,000 ft fluctuations of 10% in primary radiation would occur in a few days, and would occur simultaneously at both stations, and in both high and low momentum particles (1.5 to 15 Bev/c). The high level fluctuations correlated highly with fluctuations in neutron and meson components at the ground. Only important geomagnetic effect was in total ionization at 30 to 50 thousand ft (negative with 1 gt) and positive latitude effect above 60,000 ft at high latitudes. A wealth of data is given in table, charts and graphs. (*Same item as* 5.5–152, May 1955, *MAB.*) *Subject Headings:* **1. Latitude effects on cosmic rays 2. Cosmic ray variations 3. Cosmic ray measurement 4. Bismarck, N. D. 5. Thule, Greenland.**—*M.R.*

7D–47 551.521.64:551.510.535:551.507.362(02)

*†Newell, Homer E., Jr. (*Naval Res. Lab., Wash.*), **High altitude rocket research.** New York, Academic Press, **1953.** 298 p. 93 figs., 37 tables, numerous refs. Price: $7.50. **DLC**—Ch. 9, Cosmic rays, includes a brief history of cosmic ray discovery, and sections on the meaning of cosmic ray intensity; means for detecting and measuring cosmic rays; geometric factors in cosmic ray measurements; the role of rockets in cosmic ray research; cosmic ray intensity above the atmosphere and its variation with direction; composition of primary cosmic rays; and results of rocket measurements of cosmic rays. Fifty-four references are attached to this chapter. (For fuller abstract, see 5.5–7, May 1954, *MAB.*) *Subject Headings:* **1. Rocket measurement of cosmic rays 2. Cosmic radiation.**—*G.T.*

7D–48 551.521.64:551.524:551.543

Olbert, Stanislaw (*Dept. of Physics and Lab. for Nuclear Science, M. I. T., Cambridge*), **Atmospheric effects on cosmic-ray intensity near sea level.** *Physical Review*, 92(2):454–461, Oct. 15, **1953.** 7 figs., 11 foot-refs., 37 eqs. **DWB**—The effects of atmospheric temperature and pressure on the μ-meson intensity are studied theoretically for locations near sea level. The analysis is based on a uni-dimensional equation for the vertical differential intensity of μ mesons, studied originally by Sands. The treatment is rigorous in the sense that it includes the continuous production as well as the ionization losses of μ mesons in the atmosphere. With the help of a newly derived range spectrum of μ mesons at production and the exact expression for the survival probability of μ mesons, a three-term regression formula for the relative changes of the μ-meson intensity is derived and discussed in detail. According to this formula, the relative intensity changes are correlated not only with production height and the ground pressure (a customarily employed two-term correlation) but also with the average tropospheric temperature. This additional correlation, resulting from the ionization losses of μ mesons in the air, seems to remove some apparent difficulties in the interpretation of experimental data. In particular, it seems to explain the discrepancies found in the decay coeffi-

cients determined from diurnal and seasonal observations, respectively. *Subject Headings:* **1. Cosmic ray intensity 2. Temperature effects on cosmic rays 3. Pressure effects on cosmic rays.**—*Author's abstract.*

7D–49 551.521.64(02)

Pergner, J. and Petržílka, V., **Kosmické záření.** [Cosmic radiation.] Prague, Československá Akademie Ved, **1953.** 225 p. numerous figs., tables, refs. Unchecked.—Methods of cosmic ray research, cosmic ray intensity variations, passage of protons and particles through matter, properties of cosmic ray particles, disintegration of atomic nuclei caused by cosmic ray particles, atmospheric phenomena caused by the passage of cosmic rays and hypotheses concerning the origin of cosmic rays are discussed. *Subject Headings:* **1. Cosmic ray textbooks 2. Cosmic radiation.**—*Met. Zprávy.*

7D–50 551.521.64:537.59

Powell, C. F., **Particles of cosmic radiation.** *Nature*, London, 172(4376):477–479, Sept. 12, **1953. DWB**—Account of conference at Bagneres de Bigorre, July 6–12, **1953.** Subjects included particles heavier than protons (?about 2700 M_e) and their disintegration, heavy mesons with their modes of decay or nuclear interaction, and heavy neutral particles. *Subject Heading:* **1. Cosmic radiation.**—*C.E.P.B.*

7D–51 551.521.64

Pullar, J. D. and Dymond, E. G., **The penetrating component of cosmic radiation in the upper atmosphere.** *Philosophical Magazine*, 7 Ser., 44(353):565–577, June **1953.** 4 figs., table, 25 refs. **DWB**—The vertical intensity of the hard component of cosmic radiation at Edinburgh was measured by 3 counters separated by 2 layers of 4 cm lead, carried on balloons to average height of 17 g/cm² and one reaching 4 g/cm². The intensity increased with height to upper limit. Primary particle flux capable of penetrating 90 g/cm² Pb was 0.164/cm²/sec/ster. Primaries responsible for penetrating showers are absorbed by 120 g/cm² air. (*Same item as* 4.11–155, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cosmic ray measurement 2. Hard cosmic rays 3. Edinburgh, Scotland.**

7D–52 551.521.64

Puppi, G. (*Bologna*), **Bilancio energetico della radiazione cosmica.** [Energy balance of cosmic radiation.] *Il Nuovo Cimento*, Bologna, Supplement, 10(2):115–146, **1953.** 6 figs., 4 tables, refs. **DWB**—By making a detailed survey of recent results in cosmic ray research connected with the three principal elements of cosmic radiation balance: 1) the intensity of primary radiation, 2) nature and intensity of secondary components and 3) modalities of transformation processes, the author develops a new cosmic radiation balance which comprises higher figures throughout than those in effect previously. *Subject Heading:* **1. Cosmic ray energy balance.**—*G.T.*

7D–53 551.521.64

*Quercia, I. F. and Rispoli, B. (*Rome*), **Zenithal dependence of the penetrating component of cosmic radiation.** *Il Nuovo Cimento*, Bologna, 10(4):357–363, April 1, **1953.** 4 figs., 3 tables, foot-refs. Italian summary p. 363. **DLC**—Two experiments are reported, one performed at Cervinia (3500 m a.s.l.) and one performed at Rome, on the zenithal distribution of penetrating particles and mesons. It is found that the penetrating component at sea level can be represented by the law $I(\theta) = I_0 \cos^n \theta$, with $n = 2.14$ for $E = 500$ MeV whereas at 3500 m a.s.l. the distribution does not obey this law. At sea level, moreover, the mesonic component with energy between 0.5 an 1.9 GeV follows very closely the law $\cos^{3.06} \theta$. *Subject Headings:* **1. Cosmic ray penetration 2. Zenith angle distribution of cosmic rays 3. Rome, Italy.**—*Authors' abstract.*

7D–54 551.521.64

*Quercia, I. F. and Rispoli, B. (*Rome*), **Altitude and geomagnetic effects of positive and negative penetrating particles of cosmic radiation.** *Il Nuovo Cimento*, Bologna, 10(8):1142–1171, Aug. 1, **1953.** 18 figs., 15 tables, eqs. Italian summary p. 1171. **DLC**—Experiments performed on positive and negative penetrating particles of cosmic radiation at various altitudes and at different zenithal and azimuthal angles are described. The aim of these experiments was to get information on meson production processes. Positive excess, EW-asymmetry, NS-asymmetry and zenithal distributions for different energies and at different altitudes have been measured. All data collected have been compared with theoretical results of a plural production of mesons. Experimental results cannot be considered in disagreement with the theory. *Subject Headings:* **1. Cosmic radiation 2. Meson production.**—*Authors' abstract.*

7D–55 551.521.64

Rao, A. S.; Balasubrahmanyan, V. K.; Gokhale, G. S. and Pereira, A. W. (*all, Tata Inst. of Fundamental Res., Bombay, India*), **High altitude measurements of the intensity of cosmic radiation**

at magnetic latitudes 3°N and 19°N. *Physical Review*, 91(3):764–765, Aug. 1, 1953. fig., 3 refs. **DWB**—Comparative curves (for Bangalore and Delhi) of total cosmic radiation intensity and of the vertical intensity of cosmic radiation penetrating 10 cm of lead are presented as functions of atmospheric pressure (surface to less than 50 mb). The data were obtained in free balloon flights during the period 1951–1953. *Subject Headings:* **1. Cosmic ray intensity 2. Cosmic ray penetration 3. Pressure effects on cosmic rays 4. India.**—*G.T.*

7D–56 551.521.64

Rossi, Bruno, **Where do cosmic rays come from.** *Scientific American*, 189(3):64–70, Sept. 1953. figs. **DWB**—A fairly long popular article reviewing the several theories of cosmic ray origin: (1) solar flares or sunspots, (2) explosions of supernovae in our galaxy or (3) acceleration of high energy particles by repeated collision with floating magnetic fields such as may be associated with clouds of interstellar hydrogen. *Subject Headings:* **1. Cosmic ray origin.**—*M.R.*

7D–57 551.521.64:537.591

Salvini, G. (*Physics Inst., Milan Univ.*), **Relazione sui raggi cosmici per il Congresso di Bergamo.** [Report on cosmic radiation for the Bergamo Conference.] *Il Nuovo Cimento*, Bologna, Supplement, 10(3):269–279, 1953. 2 tables. **DWB**—The 37 papers on cosmic radiation presented at the 38th meeting of the Italian Physical Society are summarized in this account. Results and conclusions regarding the interaction of cosmic ray particles are briefly discussed. The papers reviewed deal with research conducted both in Italy and in foreign countries. *Subject Heading:* **1. Cosmic ray research.**—*G.T.*

7D–58 551.521.64

Sarabhai, V. and Kane, R. P. (*Phys. Res. Lab., Ahmedabad, India*), **Effects at Godhavn and lower latitudes of changes in energy and composition of solar cosmic rays.** *Physical Review*, 91(3): 688–689, Aug. 1, 1953. fig., 3 refs. **DWB**—Time series have been derived for changes of the amplitude and the hour of maximum of the diurnal component of the daily variation of the pressure-corrected meson intensity at Godhavn from Carnegie Institution data. While these series show some features which are strikingly similar to those observed at other stations, the variability at Godhavn is much greater than elsewhere. Comparison of the series at Godhavn with the corresponding series for the mean changes observed at Cheltenham and Christchurch permits information to be derived concerning changes in the mean energy of cosmic ray primaries responsible for the daily variation, and their "stiffness" in the geomagnetic field. On the basis of an interpretation in terms of continuous emission of cosmic rays from the sun, there is evidence for an increase in the mean energy of solar cosmic rays from 1940 to 1944. Reasons are given for believing that during 1944 the solar cosmic rays became richer in alpha particles as compared to protons. *Subject Headings:* **1. Cosmic ray variations 2. Godhavn, Greenland.**—*Authors' abstract.*

7D–59 551.521.64

Sarabhai, V.; Desai, U. D. and Kane, R. P. (*all, Phys. Res. Lab., Ahmedabad, India*), **Meteorological and extra-terrestrial causes of the daily variation of cosmic ray intensity.** *Indian Academy of Sciences, Bangalore, Proceedings, Sec. A*, 37(2):287–303, Feb. 1953. 5 figs., 5 tables, 26 refs. **DLC**—Based on studies, at Ahmedabad, India, of daily variations in intensities of cosmic rays and of the meson and electron components by means of vertical Geiger counter telescopes. Intensities are corrected for daily variation in barometric pressure, making it evident that the daily variation in electron intensity is due to the pressure effect. A residual variation of .3% in amplitude does exist, however, in total intensity and in meson intensity (maximum at 0900 local time). It is concluded that residual of meson intensity is not due to temperature or magnetic diurnal variations but to extraterrestrial causes. (*Same item as* 5.6–143, June 1954, *MAB.*) *Subject Headings:* **1. Cosmic ray variations 2. Atmospheric effects on cosmic rays 3. Pressure effects on cosmic rays 4. Ahmedabad, India.**—*M.R.*

7D–60 551.521.64

Sekido, Yataro and Yoshida, Sekiko (*Physical Inst. Nagoya Univ.*), **Distribution of cosmic-ray unusual increase over the earth.** *Japan. Science Council. Ionosphere Research Committee, Report of Ionosphere in Japan*, 7(4):147–155, Dec. 1953. 6 figs.. 3 tables, 19 refs., eqs. **DWB**—Unusual increases in cosmic radiation were observed at various stations with various types of equipment, and were published in various units of time interval. These data were reduced to a standard scale, to see their distribution over the earth. Thus a simple image of the latitude effect and the local time effect was obtained. The local time of maximum incidence is at about 3h–8h, and the geomagnetic latitude of maximum incidence seems to be about 60°–80°. *Subject Headings:* **1. Cosmic ray variations 2. Latitude effects on cosmic rays.**—*Authors' abstract.*

7D–61 551.521.64:06

Shapiro, Maurice M. (*Nucleonics Div., Naval Res. Lab., Wash., D. C.*), **International Congress on Cosmic Radiation at Bagneres de Bigorre.** *Science*, 118(3076):701–707, Dec. 11, **1953.** fig., 10 eqs. **DLC**—Conference held in French Pyrenees near the Pic du Midi July 6–12, 1953, was attended by nearly 200 physicists from 23 countries. On the fourth day the conferees visited the Pic du Midi Observatory. A complete report is given of the advances made in the special fields of K-mesons and hyperons, and on high energy interactions and meson production. Finally, progress in methods of measurement, as reported at the Congress, is discussed. *Subject Headings:* **1. Cosmic ray research 2. Cosmic radiation 3. Conferences 4. Pic du Midi Observatory, France.**—*M.R.*

7D–62 551.521.64

Sherman, Noah (*Univ. of Michigan, Ann Arbor*), **Diurnal variations in the intensity of cosmic rays underground.** *Physical Review*, 2nd Ser., 89(1):25–26, Jan. 1, **1953.** 2 figs. **DWB**—Hourly counting rates of the particles expected to reflect variations in intensity of high energy primaries are analyzed and graphically presented in variation with (1) solar and (2) sidereal time. From the first harmonic analysis, based on an oversimplified model, the experimental data indicate the possibility that about 1.7% of the μ-mesons absorbed at 8.46×10^4 g cm^{-2} underground are due to sun emitted primaries. *Subject Headings:* **1. Cosmic ray intensity 2. Underground cosmic ray variations 3. Cosmic ray diurnal variations.**—*W.N.*

7D–63 551.521.64

Stroffolini, R. (*Padova Univ.*), **Sul contributo alla componente elettronica della radiazione cosmica nell' atmosfera derivante dal decadimento delle particelle.** [The contribution to the electronic component of cosmic radiation in the atmosphere by the decay of particles.] *Il Nuovo Cimento*, 9th Ser., 10(3):300–307, March **1, 1953.** table, refs., eqs. English summary p. 307. **DLC**—Starting from the experimental spectra of the μ particles in the atmosphere, the contribution to the electronic component from the decay of the μ particles has been calculated. The BHABHA and CHAKRABARTY solution of the diffusion equations has been used, taking into account only the first two terms of the series of the solution given by these authors. The vertical intensity of the electrons with energy greater than 10^7 eV, originating from the μ particle decay is found to be markedly less than generally calculated by other authors. This can be probably justified by the fact that in all the preceding calculations the μ particle was assumed to decay into two instead of three particles. *Subject Headings:* **1. Cosmic ray electrons 2. Meson decay.**—*Author's abstract.*

7D–64 551.521.64

Süssmann, G., **Die Energieverteilung der α-Teilchen bei der Kernverdampfung unter Berücksichtigung der Spaltung I.** [The energy distribution of α particles in nucleus evaporation with regard to fission I.] *Zeitschrift für Naturforschung*, 8a(7):404–416, July 1953. 10 figs., refs., 50 eqs. **DWB**—The attempt is made to show that the frequent occurrence of "slow" α particles in stars on photographic plates is a kinematic effect; an important part of the excited nuclei disintegrates into two equally large components, and the velocity with which these fly apart is so great that the energy spectrum of the α particles is strongly distorted; that of the p-traces on the other hand only slightly. On the basis of the "gas particle model" the time-scale of the fission is calculated and compared with that of the evaporation. *Subject Heading:* **1. Cosmic ray showers.**—*C.E.P.B. (Trans. of author's abstract.)*

7D–65 551.521.64 537.59

Syracuse Univ. Dept. of Physics, **Experiments on the collision cross section of primary cosmic ray mesons.** Contract AF 19(604)-68, Final Report, Oct. 1, 1951–Oct. 31, **1953.** 13 p. 2 tables, fig. **DWB**—Two experiments are reported. One was designed to calculate the difference between the mean free path for shower production by cosmic ray protons and by π mesons in the atmosphere. The other experiment measured the internuclear collision in a cloud chamber where the showers were produced in light metals and lead, respectively. Relations between cosmic ray π mesons and the resulting μ mesons in the atmosphere are also studied. The interaction mean free path of energetic π-mesons is therefore of importance for the medium and low energy μ mesons (which are of meteorological interest). Relation to atmospheric depth is also involved in the above inter-relationships. *Subject Headings:* **1. Cosmic rays showers 2. Meson production.**—*M.R.*

7D–66 551.521.64:551.590.21

Thambyahpillai, T. and Elliot, H., **World-wide changes in the phase of the cosmic-ray solar daily variation.** *Nature*, 171(4360):918–920, May 23, **1953.** 3 figs., 3 refs. **DWB**—Cosmic ray diurnal variation at sea level is due in part to anisotropic distribution of primary radiation entering the atmosphere. The first harmonics at various stations 1932–1952 show parallel changes, time of

naximum becoming later 1932 to 1942 and then earlier again, probably a 22 year cycle. *Subject Headings:* **1. Cosmic ray diurnal variations 2. Solar effects on cosmic rays.**—*C.E.P.B.*

7D–67 551.521.64:551.524.7

Trefall, Harald, **Cosmic ray intensity and the temperature of the upper atmosphere.** *Nature*, 171(4359):888–889, May 16, 1953. fig., 3 refs., 5 eqs. **DWB**—Intensity of hard component of cosmic radiation at sea level includes a term for temperature at pressure level representing average atmospheric depth for meson production. This effect is discussed and constants determined by A. Duperier (1949, 1951) confirmed. *Subject Headings:* **1. Cosmic ray intensity 2. Upper air temperatures.**—*C.E.P.B.*

7D–68 551.521.64

Treiman, S. B. (*Chic. Univ.*), **Effect of equatorial ring current on cosmic-ray intensity.** *Physical Review*, 2nd Ser., 89(1):130–133, Jan. 1, 1953. fig., table, 9 foot refs., 21 eqs. **DWB**—An attempt to test the Chapman ring current theory by calculating the variations in cosmic ray intensity variation to be expected accompanying the intensity variation of that ring current. The calculations are based on approximations confirming the Störmer theory of cones and that all directions within the modified cones are "allowed." The experimental results show that a decrease in the magnetic field at the equator corresponds to an increase in cosmic ray intensity, contradicting qualitative arguments in the literature. *Subject Headings:* **1. Ring currents 2. Cosmic ray intensity.**—*W.N.*

7D–69 551.521.64:535.243

Tsai, Chü and Morand, Max, **Analyse spectrale des répartitions de l'intensité angulaire et de la dissymétrie Est-Ouest de la composante nucléaire du rayonnement cosmique faite au moyen d'une émulsion sensible.** [Spectral analysis of the distribution of angular intensity and East-West dissymmetry of the nuclear component of cosmic rays made with a sensitive emulsion.] *Académie des Sciences, Paris, Comptes Rendus*, 236(24):2311–2313, June 15, 1953. 3 tables, refs. **DWB**—A formula is given for calculating the zenithal distribution which can be expressed by $j(\theta)=j(0)\cos\lambda\theta$, where $\lambda=1.57\pm0.14$ for all particles; λ increases with increasing energy. For α within the limits 30–45° the dissymmetry is 0.24 ± 0.08. *Subject Headings:* **1. Zenith angle distribution of cosmic rays 2. Spectrophotometry.**—*Trans. of authors' abstract.*

7D–70 551.521.64

Tsai, Chü and Morand, Max, **Étude comparative au moyen de l'émulsion sensible des propriétés de la composante nucléaire du rayonnement cosmique au voisinage de l'équateur.** [Comparative investigation by means of a sensitive emulsion of properties of the nuclear component of cosmic radiation near the equator.] *Académie des Sciences, Paris, Comptes Rendus*, 237(18):1080–1082, Nov. 2, 1953. 2 tables, 11 refs., 3 eqs. **DWB**—The dissymmetry of slow nucleons observed at the equator with angles between 30 and 45° is 0.31 ± 0.09, which is less than a value previously estimated. The zenithal distribution may be expressed by $I=I_0\cos\lambda\theta$, where $\lambda=1.41\pm0.03$, with practically no dependence on latitude. *Subject Heading:* **1. Zenith angle distribution of cosmic ray.**—*Trans. of authors' abstract.*

7D–71 551.521.64

Tsai, Chü and Morand, Max, **Sur les répartitions de l'intensité angulaire et de la dissymétrie Est-Ouest de la composante nucléaire du rayonnement cosmique au voisinage de l'équateur, étudiées au moyen d'une émulsion sensible.** [The distribution of the angular intensity and the East-West dissymmetry of the nuclear components of cosmic rays in the vicinity of the equator, studied by means of sensitive emulsions.] *Académie des Sciences, Paris, Comptes Rendus*, 237(23):1517–1519, Dec. 9, 1953. 3 tables, refs. **DWB**—Zenith distribution of angular intensity of cosmic ray nucleons can be represented by $j(\theta)=j(0)\cos\lambda\theta$, λ increases with the energy from 0.3 ± 0.1 to 2.1 ± 0.2. The E-W dissymmetry, concentrated for α laying between 30 and 45° reaches 260 MeV. Data were obtained at Costermansville and Tamanrasset in Central Africa. *Subject Headings:* **1. Cosmic ray asymmetry 2. Zenith angle distribution of cosmic rays 3. Tamanrasset, Algeria.**—*M.R.*

7D–72 551.521.64

Van Allen, J. A. (*Iowa State Univ.*), **The cosmic ray intensity above the atmosphere near the geomagnetic pole.** *Il Nuovo Cimento*, Bologna, Ser. 9, 10(5):630–647, May 1, 1953. 7 figs., 3 tables, 26 refs. In English; Italian summary p. 647. **DWB**—With the help of new high altitude intensity measurements of Meredith, Van Allen and Gottlieb with single Geiger counters near the north geomagnetic pole, an assessment of existing knowledge of the low rigidity end of the primary cosmic ray spectrum is presented. The new Iowa rocket experiments fully confirm and substantially extend previous evidence for the marked flattening of the integral cosmic ray spectrum

below a magnetic rigidity of about $1.5 \cdot 10^9$ volts. The observed absence of low rigidity primaries is not inconsistent with a solar dipole moment as large as $0.6 \cdot 10^{34}$ gauss-cm^3; but there may be an entirely different physical cause. Preliminary rocket flights of pulse ionization chambers have been made with the intention of investigating the intensities of low rigidity heavy nuclei. *Subject Heading:* **1. Cosmic ray intensity.**—*From author's abstract.*

7D–73 551.521.64

Wataghin, G. (*Univ. of Turin*), **Recent research on cosmic radiation in the Soviet Union.** *Il Nuovo Cimento*, Ser. 9, v. 10, Suppl. No. 4:489–508, **1953.** 26 figs., 2 tables, refs. **DWB**—English reviews of 16 papers on cosmic ray physics, which were presented at the Conference on Cosmic Radiation held in June 1952 in the U.S.S.R. and which were published in *Akademiia Nauk SSSR, Izvestiia, Ser. Fizicheskaia*, v. 17, No. 1, **1953.** Many illustrations, diagrams, etc. are reproduced. This was the first such conference in 15 years in the Soviet Union. *Subject Headings:* **1. Conferences 2. Cosmic ray research 3. Cosmic ray symposia 4. U.S.S.R.**—*M.R.*

7D–74 551.521.64

Wataghin, G., **Remarks on the origin of the cosmic rays.** *Il Nuovo Cimento*, Supplement, 11(2):388–389, **1953. DWB**—Three possible origins are listed for cosmic rays: 1) local, 2) galactic and 3) intergalactic. The first two are easily understood, but problems arise for the third hypothesis that can be answered only by careful study of barometer, temperature and altitude effect of extensive cosmic ray showers. *Subject Headings:* **1. Cosmic ray origin 2. Atmospheric effects on cosmic rays.**—*M.R.*

7D–75 551.521.64

Yngve, Victor H. (*Dept. of Physics, Chicago Univ.*), **The time variation of cosmic-ray heavy nuclei.** *Physical Review*, 92(2):428–435, Oct. 15, **1953.** 5 figs., 22 refs. **DWB**—Two 4×4 Ilford G-5 photographic emulsions in contact were exposed to the cosmic radiation in such a way that one plate was moved slowly and uniformly with respect to the other. By this technique it is possible to determine the time at which heavy nuclei pass through the plates. The plates were exposed above 90,000 feet on June 4, 1952, for 8 hrs during the day. A reliable altitude record was available and was used to correct for the altitude changes during the 8 hrs. Nine hundred and forty-seven heavy nuclei with more than 10 delta rays per 100 microns, corresponding to Z greater than about 10, were traced through and their time of passage measured. This was done by new techniques which are described in detail. The data have been divided into three time intervals. The intensity during the middle interval between noon and 2 p.m. is greater by 25 ± 8.5 percent than the average of the other two. It is concluded that this is due to a real fluctuation in the intensity of cosmic-ray heavy nuclei at the top of the atmosphere. The possibility that this may be due to a dipole magnetic field of the sun is discussed. *Subject Heading:* **1. Cosmic ray variations.**—*Author's abstract.*

1954

7D–76 551.521.64

Alfvén, Hannes (*Tekniska Högskolan, Stockholm*), **The astrophysical aspect of cosmic radiation.** *Il Nuovo Cimento*, Supplement, 11(2):381–387, **1954.** 5 refs. **DWB**—A discussion of the macroscopic (as contrasted with the microscopic) aspects of cosmic rays. Energies vary from 10^{10} to 10^{17} eV. Diurnal variation is <1%, magnetic storm variations may be 1–10%, no sidereal time variations are noted; solar flare variations are as large and secondary neutron variations larger; long period (27 day) fluctuations also are found. Isotropy is important, for starlight comes from galactic plane and cosmic radiation from all directions. If cosmic rays move rectilinearly, then total energy of cosmic rays in universe is 10,000 greater than that of light. If our galaxy acts as a magnetic lens the total energy needs to be only 10^{-4} that of starlight. Fact that strong magnitude fields do affect cosmic rays by as much as 10% gives support to idea that they are of galactic or local origin. Near the earth's orbit its magnetic field is calculated as 10^{-5} gauss. *Subject Headings:* **1. Cosmic ray origin 2. Cosmic ray theory.**—*M.R.*

7D–77 551.521.64

Alfvén, Hannes (*Stockholm*), **On the origin of cosmic radiation.** *Tellus*, 6(3):232–253, Aug. **1954.** 9 figs., 3 tables, 31 refs., 14 eqs. **DLC**—The "local" theory of the origin of cosmic radiation is developed. According to the theory the radiation (possibly with exception of the highest energies) is generated in interplanetary space around the sun and trapped in an interstellar magnetic field. The acceleration takes place in electromagnetic fields in the sun's environment which are produced by the solar activity and especially associated with magnetic storms. A theory of the origin of cosmic radiation should at the same time be a theory of the extraterrestrial variations in the radiation.

The present theory incorporates the magnetic storm variation, the diurnal variation and the long me (solar cycle) variation. The acceleration process of the theory is efficient for protons and specially for heavy nuclei but is inefficient for electrons. This explains the absence of electrons n the primary cosmic radiation. The latitude "knee" is accounted for as a direct effect of the cceleration process. *Subject Heading:* **1. Cosmic ray origin.**—*Author's abstract.*

7D–78 551.521.64

Alvial Caceres, Gabriel, **Investigaciones sobre la radiación cósmica en Chile.** [Investigations n cosmic radiation in Chile.] *Pan American Union, Wash., D. C., Ciencia y Tecnologia*, 4(12):8–11, an./March **1954.** 3 photos, chart. **DPU, DWB**—Establishment of cosmic ray laboratory by the Faculty of Philosophy and Education of the University of Chile (Dept. of Physics) is reviewed. nstruments and projects are described. Work was begun on x-ray in 1951, on photometry (spectral) n 1952 and in geophysics in 1953. An observatory has been established at 4343 m at 33°09′S, 0°17′W. Glaciological investigations are also carried out in the Andes up to 5000 m altitude. *Subject Headings:* **1. Cosmic ray research 2. Chile.**—*M.R.*

7D–79 551.521.64 539.1

The anti-proton. *Current Science*, Calcutta, 23(8):247, Aug. **1954. DLC**—Note on a peculiar ray track through the pack of photographic plates, sent in a balloon up to 10,000 ft. Estimated nergy 10^{15} eV. SCHEIN (Chicago Univ.), who observed this phenomenon, assumes that it was aused by a negative proton, anticipated but never observed before. *Subject Headings:* **1. Protons 2. Cosmic ray events at high altitude. I. Schein, Marcel.**—*A.A.*

7D–80 551.521.64

Askowith, Joseph G. and Sitte, Kurt, **Penetrating showers in light and heavy elements.** Syracuse. Univ. Dept. of Physics, Contract AF 19(122)-68, Scientific Report, No. 2, **(1954?)** 20 p. 5 figs., 2 tables, 15 refs., eqs. **MH-BH**—A large cloud chamber fitted with one thick "producer plate" of light materials and with eight $\frac{1}{4}$ in. lead plates was operated at Echo Lake, Colo. (altitude 3260 m) to record penetrating showers originating in three light elements (Li, C, Al) and in lead. The average primary energies, estimated with the "F-plot" method of DULLER and WALKER, were between 20 and 25 Bev. From a comparison of the shower rates in the producer plates and in the top lead plate, upper and lower limits for the transparencies of the light elements are obtained, the latter if correction is made for the differences in the primary energies. More reliable values, however, are derived from a direct comparison of the rates in the three light elements. *Subject Headings:* **1. Cosmic ray penetration 2. Penetrating showers 3. Echo Lake, Colo.**—*Authors' abstract.*

7D–81 551.521.64:537.591.5

Bachelet, F. and Conforto, A. M. (*both, Istituto di Fisica, Rome Univ.*), **Time variations of cosmic ray intensity,** *Il Nuovo Cimento*, Bologna, 12(6):923–929, Dec. 1, **1954.** 2 figs., 7 refs. Italian summary p. 929. **DWB**—An apparatus for the continuous registration of the total ionization component of cosmic rays at sea level has been set up at Rome. The purpose is to study the correlations between cosmic ray intensity and atmospheric, geomagnetic and solar phenomena. The apparatus consists of telescopes of Geiger-Müller counters in triple coincidence, directed vertically, and included at 30° to the vertical in the direction South and North respectively. The difference between the diurnal variations in two inclined directions is considered free from atmospheric effects and is thus able to show up an anisotropy of the primary radiation. There are four independent telescopes in each direction, with a total of about 27,000 coinc./h in North and South directions, respectively, and about 48,000 coinc./h in the vertical. The counters are held thermostatically at (30 ± 1)°C. The methods used to reduce the instrumental inequalities and obtain the maximum operational stability and continuity are described. The preliminary results obtained in the first counting period, from Jan. to March 1954, are presented. *Subject Headings:* **1. Cosmic ray variations 2. Cosmic ray measurement 3. Rome, Italy.**—*Authors' abstract.*

7D–82 551.521.64

Barrett, P.; Cocconi, G.; Eisenberg, Y. and Greisen, K. (*all, Cornell Univ., Ithaca, New York*), **Diurnal variations of the intensity of cosmic rays far underground.** *Physical Review*, 95(6):1571–1572, Sept. 15, **1954.** fig., 8 refs. Idem, **Atmospheric temperature effect for mesons far underground.** *Ibid.*, p. 1573–1575. 2 figs., table, 3 refs. **DWB**—In the analysis of 249,762 coincidences due to cosmic rays at a depth of 1600 m.w.e. underground, no diurnal variation of the rate with respect to solar or sidereal time was found. With high confidence the amplitudes of such variations may be said to be less than 1% of the average intensity. The average energy of the primary cosmic rays responsible for the particles recorded was about 4×10^{13} ev. A continuation of measurements previously reported has led to verification of the positive temperature effect for μ mesons detected

at 1574 m.w.e. underground, which are created in the atmosphere with an average energy of abou 8×10^{11} ev. The new result for the temperature coefficient at this depth is $0.33\pm0.13\%$/degree C and this value combined with the previous measurement yields an average of $0.46\pm0.11\%$/degree agreeing with the value expected if the $\pi-\mu$ decay process is responsible for all, or most, of these mesons. *Subject Headings:* **1. Cosmic ray diurnal variations 2. Underground cosmic ray variation** —*Authors' abstract.*

7D–83 551.521.64:551.54

Barteis, G. (*Rostock Met. Obs.*), **Intensitätsvariationen der kosmischen Strahlung bei starke atmosphärischen Druckänderungen.** [Intensity variation of cosmic radiation during great change in atmospheric pressure.] *Zeitschrift für Meteorologie*, 8(7/8):230–235, July/Aug. **1954.** **DWB**— Variations in the intensity of cosmic radiation which cannot be correlated for meteorological effect with known correction formulas, occur after intensive changes in air masses. In order to take int account the opposite course of atmospheric temperature the author determined anew the interv and positive temperature effects by means of a modified regression equation. The anomaly canno be explained even with these influence magnitudes. *Subject Headings:* **1. Cosmic ray variation 2. Pressure effects on cosmic rays.**—*Trans. of author's abstract.*

7D–84 551.521.64 537.5

Beiser, Arthur (*New York Univ.*), **The zenith-angle variations of cosmic-ray meson intensity** *Journal of Geophysical Research*, 59(2):253–255, June **1954.** 4 refs., 5 eqs. **DWB**—The observe $\cos^k$ zenith-angle variation of μ-meson intensity at low elevations is derived on the basis of a p^{-} meson momentum spectrum at production. It is found that $k=n-1$ to a good approximation, i agreement with experimental evidence. The region of validity of this relationship is discussed *Subject Headings:* **1. Meson intensity 2. Zenith angle variations of cosmic rays.**—*Author's abstrac*

7D–85 551.521.6

Benzi, V. (*Cagliari Univ.*), **Bilancio energetico della radiazione cosmica presso l'equatore** [Energy balance of cosmic radiation near the equator.] *Il Nuovo Cimento*, Bologna, 9th Ser 11(6):686–687, June 1, **1954.** 10 refs. **DWB**—Basic values of the energy balance (ionization ground level radiation, nuclear evaporation and neutron production) of cosmic radiation at 3°N lat. are indicated on the basis of numerical results obtained by various authors. *Subject Heading* **1. Cosmic ray energy balance.**—*G.T.*

7D–86 551.521.64:537.591.

Bertolino, G. and Pescetti, D., **On cosmic rays jets.** *Il Nuovo Cimento*, Bologna, 12(5):630–638 Nov. 1, **1954.** 13 figs., 13 refs. **DLC**—Twenty-nine jets found in the plates which were launche at Cagliari in the summers of 1952 and 1953 have been studied. The mean energy for mesons emitte in each jet is calculated after introduction of the anelasticity coefficient; it is inferred that the value for said energy in the low multiplicity jets are slightly greater than in high multiplicity jets. Angula distribution in the jets is studied; the results do not disagree with an isotropic distribution. *Subje Headings:* **1. Cosmic ray showers 2. Cagliari, Italy.**—*Authors' abstract.*

7D–87 551.521.64:537.5

Brunsberg, Ernst-Åke and Dattner, Adam (*Royal Inst. of Tech., Stockholm*), **On the interpreta tion of the diurnal variation of cosmic rays.** *Tellus*, 6(1):73–83, Feb. **1954.** 6 figs., 21 refs., 10 eqs **DLC**—The recorded data of diurnal variation of cosmic ray intensity are analyzed. By using th known deflection of the cosmic ray particles in the geomagnetic field (BRUNSBERG and DATTNER 1953) and under an assumption of an anisotropy in the primary cosmic radiation, it is shown that th momentum of the primary radiation and the direction of the anisotropy can be determined. Th anisotropy is explained as an effect due to the distribution of cosmic ray particles rotating with th solar magnetic field as suggested by H. ALFVÉN. The diurnal variation is ascribed to the earth' rotation in the anisotropic distribution of cosmic ray particles. The theoretical amplitude of thi variation is calculated. *Subject Headings:* **1. Cosmic ray diurnal variations 2. Primary cosmic rays** —*Authors' abstract.*

7D–88 551.521.6

Brunsberg, Ernst-Åke and Dattner, Adam (*Royal Inst. of Tech., Stockholm*), **Variations of the cosmic ray intensity during magnetic storms.** *Tellus*, 6(3):254–259, Aug. **1954.** 7 figs., 13 refs. eqs. **DLC**—A simple mechanism has been suggested by H. ALFVÉN to explain the main feature of the variation of cosmic ray intensity during magnetic storms. Cosmic ray particles are accelerate or retarded in the electric fields of ionized beams, which are sent out from the sun. Particle orbit hitting the earth have been calculated for different momenta and for solar magnetic fields decreasin with distance as r^{-3}, r^{-2} and r^{-1}. The influence on the particles of beams of different length an

eadth has been analyzed. A beam length of a few times the orbital radius of the earth and par- les with momenta in the range 20–40 GeV Z/c give a time variation in cosmic ray intensity similar the variation measured during a magnetic storm. This requires a solar magnetic field to 10^{-5} uss at the earth's orbit. *Subject Headings:* **1. Cosmic ray variations 2. Cosmic ray theory Magnetic storms.**—*Authors' abstract.*

7D–89 551.521.64:551.594.12

Burch, P. R. J., **Cosmic radiation: ionization intensity and specific ionization in air at sea level.** *hysical Society at London, Proceedings, Ser. A*, 67(5):421–430, 1 May **1954.** 3 figs., 29 refs. **DWB** -Measurements in pressurized ionization chambers in 1931–38 reduced to sea level show wide ariations. Sources of error are discussed. Average specific ionization is recalculated as 81.5±3.5 n pairs/cm. *Subject Heading:* **1. Cosmic ray ionization.**—*C.E.P.B.*

7D–90 551.508.25:551.507.321.2:551.521.64

Burgwald, G. M. and Reiffel, L., **Balloon-borne radiation telemetering system.** *Electronics*, lbany, N. Y., 27(5):138–141, May **1954.** 4 figs., photos. **DLC**—A scintillation counter measuring he low-energy gamma-ray component of cosmic radiation is the basic part of the telemetering ystem described in this report. Technical details of the air-borne and ground units are given in ext, photographs and circuit diagrams. (For fuller abstract, *see* 5E–150, May 1954, *MAB.*) *ubject Headings:* **1. Cosmic ray instruments 2. Plastic balloons.**—*G.T.*

7D–91 551.521.64

Cernigoi, C. and Poiani, G., (*Trieste Univ.*), **Sullo spettro della componente fotonica al livello el mare.** [The spectrum of the photon component at sea level.] *Il Nuovo Cimento*, Bologna, 1(1):41–48, Jan. 1, **1954.** 2 figs., 7 refs., 4 eqs. English summary p. 48. Also their: **Sullo spettro ella componente fotonica nella bassa atmosfera.** [The spectrum of the photon component in the ower atmosphere.] *Ibid.*, 12(6):957–958, Dec. 1, **1954.** fig., 7 refs. **DWB**—The absorption of the hoton component in lead at sea level and at mountain altitude has been measured with an anti- oincidence counter telescope. The absorption coefficient is slightly higher at mountain altitude han at sea level, as is to be expected if appreciable numbers of photons at mountain altitudes are roduced by π^6s. *Subject Headings:* **1. Cosmic ray photons 2. Cosmic ray spectrum.**—*Physics bstracts, No. 2843, 1955.*

7D–92 551.521.64

Chasson, Robert L. (*Dept. of Physics, Calif. Univ., Berkeley*), **Cosmic-ray intensity fluctuations t sea-level.** *Physical Review*, 96(4):1116–1123, Nov. 15, **1954.** 6 figs., 44 refs., 5 eqs. **DWB**—eomagnetic and atmospheric influences on sea-level cosmic radiation have been studied at Berkeley, alif. (95-m elevation, 44°N geomagnetic lat.). The hard (20-cm lead absorber) and total intensities ere measured with wide-angle triple-coincidence counter telescopes, and fluctuations of intensity ere compared statistically with changes of barometric pressure, pressure-altitude, and temperature f the lower stratosphere. The atmospheric coefficients found by DUPERIER were verified for the 00 mb region, but radiosonde data were not complete enough to permit calculations for higher trata of the atmosphere. The hard and total intensity data, corrected to constant barometric ressure, were examined for fluctuations that could be correlated with geomagnetic disturbances. No apparent cosmic ray changes accompanied any of seven geomagnetic sudden commencements. Of eighteen magnetic storm periods occurring over eight months, only four appeared definitely to e accompanied by cosmic ray intensity decreases. No increases of intensity occurred during these eriods. Of the four decreases observed, two were unusual in that the decrease occurred an ap- reciable time before the measurable geomagnetic disturbance (May 27 and June 25, 1951). These wo events occurred during time of very great sunspot activity, but only a loose genetic relationship ould be established between the sunspot behavior and the prestorm cosmic ray decreases. *Subject leading:* **1. Cosmic ray variations.**—*Author's abstract.*

7D–93 551.521.64:537.591.15

Corinaldesi, E. (*Dublin Inst. for Advanced Studies*), **Remark on an unusual cosmic ray event.** *il Nuovo Cimento*, Bologna, 12(4):571–572, Oct. 1, **1954.** 3 refs. **DWB**—Discusses the interpreta- ion of a photon shower recently observed by SCHEIN et al. at an altitude of 100,000 ft. It is pointed ut that if this event is interpreted as being due to the annihilation of an anti-proton the probability f production of the observed number of photons is very low, possibly as low as that for the event eing a fluctuation in a normal electron-photon cascade. *Subject Headings:* **1. Cosmic ray events t high altitudes (100,000 ft). I. Schein, M. II. Haskin, D. M. III. Glasser, R. G.**—*Physics Ab- tracts, No. 370, 1955.*

7D–94 551.521.64

Dardis, J. G. and McCusker, C. B. A., **A possible variation in the rate of local penetrating showers.** *Physical Society of London, Proceedings, Ser. A*, 67(11):1026–1027, Nov. 1, **1954.** 3 refs. **DWB**—Local penetrating showers at Dublin showed a maximum of 1.64 per hr at 17–21h G.M.T. and a minimum of 1.43 at 9–13h. If real, this effect is probably associated with very high energy primaries. (*Same item as* 6.7-202, July 1955, *MAB.*) *Subject Headings:* **1. Penetrating showers 2. Dublin, Ireland.**—*C.E.P.B.*

7D–95 551.521.64

Davis, Leverett, Jr. (*Calif. Inst. of Tech., Pasadena*), **Anisotropy of high-energy cosmic rays.** *Physical Review*, 96(3):743–751, Nov. 1, **1954.** 3 figs., table, 21 refs., 17 eqs. **DWB**—Review of the evidence indicates that a magnetic field of the order of 10^{-5} gauss probably lies along a spiral arm of the galaxy. If so, any anisotropy observed in high-energy cosmic radiation must be associated with this field. Anisotropy might be due to: (a) acceleration by FERMI's mechanism, either by his longitudinal collisions or by betatron effects; (b) diffusion along field lines toward a region where the cosmic rays escape from the galaxy; (c) inhomogeneities in cosmic ray density normal to the field lines. From symmetry considerations theoretical expressions are developed for the cosmic ray flux as a function of direction and for the resulting sidereal time dependence of extensive showers as a function of latitude and the orientation of the detecting apparatus. If atmospheric effects can be corrected for, the main harmonics predicted of detailed calculations based on a specific theory of the origin of cosmic rays and on the way the extensive reports of measurements by CRANSHAW and GALBRAITH and by FARLEY and STOREY seem to indicate tentatively that the measurements of DAUDIN and DAUDIN require some other explanation. *Subject Headings:* **1. Cosmic ray asymmetry 2. Cosmic ray theory.**—*Author's abstract.*

7D–96 551.521.64

Debenedetti, A.; Garelli, C. M.; Tallone, L. and Vigone, M., **A negative hyperon decaying in flight.** *Il Nuovo Cimento*, Bologna, 12(6):952–953, Dec. 1, **1954.** fig., 3 refs. Also, same authors and Wataghin, G., **On narrow showers of pairs of charged particles.** *Ibid.*, p. 954–956. 2 tables, 2 refs. **DWB**—The negative hyperon is emitted from a star observed in nuclear emulsion (exposed at 80,000 ft) and after travelling 927 m decays, giving rise to a charged secondary which travels 16,590 m and then comes to rest producing a σ star. The suggested decay scheme for the hyperon is $y^- \rightarrow n + \pi^- + (107 \pm 15)$ MeV.—The second paper is a preliminary report on measurements of two showers observed in the stripped emulsions at 80,000 ft. The showers consist only of pairs of charged particles (presumably electrons) and are similar to the event described by SCHEIN et al. *Subject Headings:* **1. Cosmic ray showers at high altitudes 2. Cosmic ray hyperons.**—*Physics Abstracts, Nos. 3128 and 2841, 1955.*

7D–97 551.521.64(02)

†Dobrotin, N. A., **Kosmicheskie luchi.** [Cosmic rays.] Moscow, Gos. Izdat. Techniko-Teoreticheskoĭ Literatury, **1954.** 320 p. 150 figs., 3 tables, bibliog. p. 310–320. 417 refs. **DLC**—A textbook covering the most recent (up to 1953) discoveries in cosmic ray physics in the U.S.S.R. and other countries, for the nonspecializing physicist. The qualitative characteristics and basic theory of hard and soft components, μ and π mesons and other elementary particles, ionization, atmospheric showers and other secondary effects, geomagnetic and altitude effects, intensity variations with time of day, season and solar cycle, etc. The theory, illustrations, curves, etc. are easily interpreted without a great deal of mathematical or atomic physics background, yet the mathematics is not ignored. Finally, the text comprises a most thorough literature review, in view of its coverage of several hundred Russian sources not generally included in cosmic ray textbooks. *Subject Heading:* **1. Cosmic ray textbooks.**—*M.R.*

7D–98 551.521.64:612:616

†Duell, G. and Duell, B. (*Calif. Acad. of Sciences*), **Organic responses to cosmic rays and their secondaries.** *Meteorological Monographs*, Boston, 2(8):61–67, **1954.** fig., 40 refs. **MH-BH**—The literature on the biological effects of both primary and secondary cosmic radiation is reviewed. Observational and experimental evidence on the relationship of cosmic ray intensity to cancer mortality, the biologic effect of ordinary rays on *Drosophila melanogaster*, bacteria, plants, and on the carcinogenic action of cosmic rays on mice, etc. are considered. (*Same item as* 6.7–203, July 1955, *MAB.*) *Subject Headings:* **1. Biological effects of cosmic radiation 2. Carcinogenesis.**—*I.L.D.*

7D–99 551.521.64:550.385

Ehmert, Alfred, **Zum Verhalten der kosmischen Ultrastrahlung bei magnetischen Stürmen.** [On the blocking of cosmic radiation during magnetic storms.] *Naturwissenschaften*, 41(14):317–318, July **1954.** fig., 12 refs. **DLC**—On the night of July 26–27, 1946, a large negative horizonta

gnetic intensity set in at Huancayo, decaying exponentially in 78 hrs. Cosmic radiation at nchester and Cheltenham was not affected on night of 26–27 but ceased on 27th. In the storm .3.42 the cosmic radiation decreased more in the first than in the second phase, probably because different speed of solar particle clouds. *Subject Heading:* **1. Geomagnetic effects on cosmic rays.** *C.E.P.B.*

7D–100 551.521.64

Eidus, L. Kh., **Kosmicheskie luchi.** [Cosmic rays.] *Priroda*, Moscow, 43(7):10–20, July 54. 8 figs. **DLC**—A nontechnical article dealing with the origin of cosmic rays and their properties. Soviet contributions to the knowledge of cosmic rays are mentioned. *Subject Heading:* **Cosmic ray origin.**—*I.L.D.*

7D–101 551.521.64:523.7

†Elliot, H., **Cosmic rays and the sun.** *International Council of Scientific Unions, Brussels, Eighth Report of the Commission for the Study of Solar and Terrestrial Relationships.* Paris, **1954.** 171–182. 3 figs., 35 refs. **DWB**—There has been no larger increase in cosmic ray intensity ce 1949 but it has been shown that small flares can produce changes in intensity of about 0.3% the morning side of the earth. The distribution suggests a source on or near the sun. The use of decreases of cosmic ray intensity during magnetic storms is not clear. The time of maximum the first harmonic of the solar daily variation changed from about noon in 1932 to 15–16 h in 42 and back again by 1952. The constancy of the energy spectrum above lat. 50° cannot be e to a solar magnetic field. *Subject Headings:* **1. Cosmic radiation 2. Solar effects on cosmic rs.**—*C.E.P.B.*

7D–102 551.521.64

†Ellis, R. A., Jr.; Gottlieb, M. B. and Van Allen, J. A. (*all, Dept. of Physics, Iowa State Univ.*), **w-momentum end of the spectra of heavy primary cosmic rays.** *Physical Review*, 95(1):147–159, ly 1, **1954.** 19 figs., 5 tables, 28 refs., 16 eqs. **DWB**—Measurements of the intensity of heavy mary cosmic ray nuclei have been made above the atmosphere by means of the new Iowa balloon-nched rocket ("rockoon") technique at geomagnetic latitudes $\lambda = 56°$, 76°, and 86°. The easuring instrument was a thin-walled, pulse-ionization chamber of 15-cm diameter. The served data, in conjunction with geomagnetic theory, demonstrate a complete or nearly complete sence of primary heavy nuclei of $Z \geq 6$ having a magnetic rigidity less than 1.5×10^9 volts $/mc < 0.8$), the result being the most significant for the C, N, O group. It is noted that this ectral cutoff occurs at closely the same magnetic rigidity, and distinctly not at the same velocity, the previously reported cutoff in the spectra of primary protons and a particles. *Subject Headings:* **Primary cosmic rays 2. Cosmic ray spectrum.**—*Authors' abstract.*

7D–103 551.521.64

Farley, F. J. M. and Storey, J. R., **The sidereal correlation of extensive air showers.** *Physical ciety of London, Proceedings, Ser. A*, 67(11):996–1004, Nov. 1, **1954.** 5 figs., table, 14 refs. Also eir: **Sidereal correlation of high-energy cosmic rays.** *Nature*, London, 173(4401):445, March 6, 54. 2 refs. **DWB**—About 3×10^5 extensive air-shower events were recorded at Auckland (alt. m, lat. 37°S) with 3 counter trays at the corners of a 4 m triangle, each of sensitive area 2360 cm², the period Feb. 1951 to Feb. 1952. The results show a solar diurnal amplitude of $(1.45 \pm 0.25)\%$ th maximum at (2.7 ± 0.6) hours local solar time and a sidereal diurnal amplitude of $(1.10 \pm 0.26)\%$ th maximum at (19.9 ± 0.9) hours local sidereal time (standard errors). By introducing the ncept of antisidereal time (there are 364.2 antisidereal days per year) an allowance is made for e seasonal amplitude modulation of the solar diurnal variation. When this correction is applied, e true sidereal diurnal amplitude becomes $(1.43 \pm 0.38)\%$ with maximum at (17.6 ± 1.0) hours al sidereal time. The results indicate a maximum in the cosmic ray intensity when the galactic ane is overhead. The note in **Nature** is a summary of the same information. *Subject Headings:* **Sidereal time relations of cosmic rays 2. Auckland, New Zealand.**—*Authors' abstract.*

7D–104 550.385:551.521.64 537.5

Fermi, E. (*Inst. for Nuclear Studies, Chic. Univ.*), **Galactic magnetic fields and the origin of smic radiation.** *Astrophysical Journal*, Chicago, 119(1):1–6, Jan. **1954.** 5 foot-refs., 14 eqs. **LC, DWB**—The direction of polarization of stellar light indicates that magnetic lines of force are nt from parallel about 10° by the transverse component of turbulent motion of the interstellar atter. The theory presented here leads to the conclusion that the magnetic field is strong enough force back into a more nearly parallel trajectory any particles which deviate more than 10° from arallel. Thus the spiral motion of cosmic ray particles of 10 bev energy has a radius about $\frac{1}{3}$ that the earth's orbit. The time for acceleration is calculated at 15 million yrs. The escape time r cosmic radiation (from the galaxy) is estimated at about 10 million yrs, so the rays must be

repeatedly renewed. Stars (like our sun) may be the injectors (or source) of cosmic rays. *Subject Headings:* **1. Cosmic ray origin 2. Interstellar turbulence 3. Geomagnetic effects on cosmic ra 4. Fermi theory.**—*M.R.*

7D–105 551.521.64 537

Firor, John W.; Simpson, J. A. and Treiman, S. B., **Production of cosmic radiation at the su** *Physical Review*, 95(4):1015–1019, Aug. 15, **1954.** 2 figs., 9 refs., 8 eqs. **DWB**—A calculation made of the average production rate of 4-Bv cosmic ray particles at the sun. The calculation based upon the recent experimental evidence that the frequently occurring small solar flares produ temporary increases of neutron intensity in suitably located neutron pile detectors. This producti rate, average over the 11-year solar cycle, is somewhat in excess of the absorption rate of 4-B particles by bodies in the solar system. If the production at the sun is to account for most of t observed cosmic radiation intensity, a trapping magnetic field is required. Limits on the size such a trapping volume are estimated by considering the limits of cosmic ray lifetime; the requir ment of a high degree of radiation isotropy at the earth is satisfied. The existence of high ener particles in the cosmic radiation imposes the principal difficulty for any solar origin hypothes *Subject Headings:* **1. Cosmic radiation 2. Cosmic ray origin.**—*Authors' abstract.*

7D–106 551.521.

Forbush, Scott E. (*Carnegie Inst. of Wash., D. C.*), **World-wide cosmic-ray variations, 193 1952.** *Journal of Geophysical Research*, 59(4):525–542, Dec. **1954.** 16 figs., 10 refs. **DLC**—Annu means from continuous registration of cosmic ray ionization at four stations from 1937 to 1952 sho a variation of nearly four percent, which is similar at all stations and which is negatively correlat with sunspot numbers. This variation in cosmic ray intensity is quite similar for the annual mea of all days, international magnetic quiet days, and international magnetic disturbed days, whi indicates that it is not due to transient decreases accompanying some magnetic storms. Althou the cosmic ray intensity at some stations is affected by meteorological conditions, it is shown th on the average the cosmic ray changes observed at Huancayo agree well with those of other station From an analysis of the variability of daily means at Huancayo and a sample comparison wi SIMPSON's neutron data, it is concluded that the cosmic ray ionization at Huancayo is very litt affected by meteorological effects. Through a comparison with NEHER's balloon observation evidence is provided to indicate the reliability of cosmic ray results at Huancayo over long perio of time. The relation between cosmic ray decreases and some measures of geomagnetic activi is indicated, and it is shown that the major transient decreases in cosmic ray intensity occur duri magnetic disturbance. Graphs are included which depict the daily means of cosmic ray intensi at Huancayo for all available data, 1937–1953. *Subject Headings:* **1. Cosmic ray variations 2. Hua cayo, Peru.**—*Author's abstract.*

7D–107 551.521.

Gill, P. S., **Variation in cosmic ray intensity at sea-level and mountain altitudes.** *Science a Culture*, Calcutta, 19(10):[3]–[4], April **1954. DLC**—A lecture giving general factual knowled of intensity variations in cosmic radiation with latitude, around the geomagnetic equator (longitu effect), temperature, height, hard and soft components, zenith angle, pressure and source, a various combinations of these variables (e.g., variation of latitude effect with height or vice-vers Sporadic effects such as during magnetic storms or solar flares are also mentioned. (*Same item* 6.5–151, May 1955, *MAB.*) *Subject Heading:* **1. Cosmic ray variations.**—*M.R.*

7D–108 551.521.

Gottstein, K. (*Max Plack Inst., Gottingen*), **On the fragmentations of heavy cosmic ray nucl** *Philosophical Magazine*, London, 45(363):347–359, April **1954.** fig., 8 tables, 13 refs., 3 eqs. Short version in: *Il Nuovo Cimento*, Supplement, 11(2):377–380, 1954. table, 3 refs. **DWB**—An analys of 108 events from photographic emulsions exposed at 95,000 ft in which nucleus with charge $Z \geq 3$ suffered a collision give information on (1) the nature of the disintegration products, (2) t proportion of Li, Be and B nuclei arriving at the top of the atmosphere, (3) the energy distributio (4) the meson production in collision of heavy nuclei and (5) results of collision of heavy nuc with hydrogen atoms. *Subject Heading:* **1. Cosmic ray events at high altitude.**—*M.R.*

7D–109 551.501.9:551.

The Gulmarg Observatory. *Physics Today*, 7(6):8, June **1954.** Also: Gill, P. S., **Gulmar research observatory.** *Nature*, London, 174(4424):300–301, Aug. 14, **1954. DLC**—Located 28 m from Srinagar, Kashmir, at 23°32′N, and 75°E at 9000 ft elevation, this high altitude resear laboratory in the Himalayas is especially favorably located for cosmic ray research. ARTHUR COMPTON of the U. S. dedicated the new observatory April 4, 1954, though the observatory w established about 2 years earlier. It is under the joint auspices of Muslim University at Aliga

Univ. of Jammu and Kashmir. It is inaccessible by road in winter but can remain open from -March to end of Oct. P. S. GILL of Aligarh Univ. is director. His note in **Nature** is an account ne foundation of the Observatory. *Subject Headings:* **1. High altitude observatories 2. Cosmic research 3. Gulmarg Observatory, Kashmir 4. Srinagar, Kashmir.**—*M.R.*

7D–110 551.521.64:537.591.15

Haber-Schaim, U. (*Rehovoth, Israel*) and Yekuteli, G. (*Tel Aviv, Israel*), **Energetic nuclear risions in the upper atmosphere, Pt. 1, The nucleon pion cascade.** *Il Nuovo Cimento*, Bologna, 12):172–187, Feb. 1, **1954.** fig., 4 tables, 17 foot-refs. Italian summary p. 187. **DLC, DWB**— nucleon pion cascade in the upper atmosphere is treated by an extension of the FERMI theory of n production. The cascade equations are solved by an expansion in powers of the atmospheric th. The contribution of primary alpha particles is considered in detail. The results are applied he calculation of the attenuation mean free path of the nucleonic component and the ratio of tral to charged nuclear particles. *Subject Headings:* **1. Cosmic ray showers at high altitudes Nucleonic component of cosmic rays.**—*Authors' abstract.*

7D–111 551.521.64

Hanau, Richard, **Mi casa es la suya.** [My house is yours.] *Physics Today*, 7(11):10–15, Nov. 4. photos., 3 refs. **DLC**—This account of scientific activities in Puerto Rico includes a fairly ailed description of two cosmic-ray projects at Rio Piedras (directors, L. DE ROSARIO and A. BAS) and the ionosphere project at Mayaguez (M. WIEWALL). Objectives and methods of earch are explained. Cosmic ray instruments and ionospheric radio equipment are shown in d photographs with captions. *Subject Headings:* **1. Cosmic ray research 2. Puerto Rico.**—*G.T.*

7D–112 551.521.64

Hazen, W. E. (*Univ. of Michigan, Ann Arbor*) and Williams, R. W. (*Mass. Institute of Technology, Cambridge*), **Structure of air showers.** *Physical Review*, 93(3):578–586, Feb. 1, **1954.** 7 figs., ables, foot-refs. **DWB**—Cosmic ray air showers of total energy in the range 10^{14} to 10^{15} ev have n studied at 3260 m elevation with a large multiplate cloud chamber in combination with five thin- lled ionization chambers. The spatial distribution of electrons near the shower axis is usually smooth function of distance with a singularity less marked than $1/\gamma$. Evidence is presented, wever, to show that some showers have a lumpy structure near the axis. The showers are very or in high energy electrons and photons near the axis, relative to expectation for a single electron- oton cascade. The angular distributions of shower axes are found for various shower sizes and ve to be quite similar to those expected for single electron-photon cascades. The implications various shower models are discussed and a fairly extensive nucleonic cascade is indicated. *Subject ading:* **1. Cosmic ray showers.**—*Authors' abstract.*

7D–113 537.59

Hodgson, P. E., **Fundamental particles: the present situation.** *Science News*, 31:49–68, **1954.** C—Summary of knowledge of fundamental particles based on International Congress on Cosmic diation, Bagneres-de-Bigorre July 1953. Methods of research are described. Nomenclature is out, types of particles described and their nature discussed. While much research can now be ne with accelerators, nuclear interactions of the highest energy can only be studied by using rticles found in cosmic radiation. (For similar article by same author in Science Progress, Oct. 54, *see item* 6.6–209, June 1955, *MAB.*) *Subject Headings:* **1. Fundamental particles 2. Cosmic diation.**—*C.E.P.B.*

7D–114 551.521.64:551.571

†Iona, Mario, **Correlation of meteorological parameters with cosmic ray data.** Denver. Univ. ept. of Physics, Contract AF 19(122)-54, Final Report, July 31, **1954.** 66 p. 5 figs., 7 tables, refs. **DWB**—An analysis of pressure, temperature and humidity effects on hard and soft components of cosmic rays, as observed at Denver (5400 ft), Echo Lake (10,700 ft) and Mt. Evans 4,100 ft) in Colorado. Apparatus, meteorological data, recording equipment, method of analysis, mparison with other methods, etc. Temperature effect depends on depth of temperature change well as on momentum of radiation. Correlations with weather were fairly good for high energy mponents, but poor for low energy components. Barometric effects are the reverse of those pected, because of moisture components involved in pressure changes. Upper air soundings used this study were obtained at Lowry Air Force Base for 700 to 100 mb levels. (For Reports No. 1–8, *e item* 7C-78, March 1956, *MAB.*) *Subject Headings:* **1. Temperature effects on cosmic rays Humidity effects on cosmic rays 3. Denver, Colo.**—*M.R.*

7D–115 551.521.64:551.515.8

*Jacklyn, R. M., **The barometer coefficient and air mass effects on cosmic rays at Macquarie land.** *Australian Journal of Physics*, Melbourne, 7(2):315–321, June **1954.** 2 figs., 3 tables,

2 eqs., 8 refs. **DWB**—The changes in cosmic ray intensity associated with the passage of weathe fronts over the observing stations have been investigated, using data from Macquarie Island. Th effects can be explained in terms of the different way in which the height of the production laye for mesons varied with surface pressure for warm moist and cold day air masses. The barometer coefficients found for these air masses are, respectively, -0.120 ± 0.058 percent per mb and -0.22 ± 0.041 percent per mb for the penetrating component. These results indicate that the frequent observed fluctuations in short-term barometer coefficients may be traceable to changes in air mas types. *Subject Headings:* **1. Air mass effects on cosmic rays 2. Macquarie Island.**—*Author abstract.*

7D–116 551.521.64:551.507.36

Johnson, C. Y.; Davis, L. R. and Siry, J. W. (*Naval Res. Lab., Wash. 25, D. C.*), **Cosmic ra measurements in rockets.** (In: Boyd, R. L. F.; Seaton, M. J. and Massey, H. S. W. (eds.), **Rocke exploration of the upper atmosphere.** London, Pergamon, **1954.** p. 306–312. 6 figs., 2 table 11 refs.) **DWB**—Primary cosmic ray intensity and composition measurements have been made a geomagnetic latitude $\lambda = 41°N$ with rocket-borne instruments. The measured primary intensit is 0.70 ± 0.005 particle per cm²-sec.-sterad, of which 0.058 ± 0.005 are protons, 0.011 ± 0.002 a alpha particles, and 0.001 ± 0.001 are particles for which $Z > 2$. At the same latitude primary gamm radiation in the energy range 0.1–90 MeV was found to constitute about 0.1 percent of the tot incoming cosmic ray energy flux. *Subject Headings:* **1. Primary cosmic ray intensity 2. Rock measurement of cosmic rays.**—*Authors' abstract.*

7D–117 551.521.64:550.38

Kitamura, Masatoshi (*Met. Res. Inst., Tokyo*), **What types of magnetic storm are accompanie by the decreases of the intensity of cosmic rays?** *Indian Journal of Meteorology and Geophysic* Delhi, v. 5, Spec. No.: 153–156, Dec. **1954.** 4 figs., 2 tables, 2 refs. **DWB**—On the basis of con tinuous observation data of cosmic rays for the period 1936 through 1945 at Huancayo, Peru, an making use of the magnetograms for the same period at Kakioka in Japan, the author studied th changes in cosmic ray intensity connected with the magnetic disturbances of various types, and h succeeded in discovering a simple connection between the geomagnetic storms and the correspondin changes in cosmic ray intensity, as follows: A large magnetic storm preceded by the sudden con mencement, namely, of S. C. type having the daily sum of geomagnetic planetary indices large than 34, is accompanied by the decreases of cosmic-ray intensity which are larger than 0.7% in th difference of the daily mean from that of the previous day. But this paper does not deal with th theories for this relation and they will be reported later. *Subject Headings:* **1. Geomagnetic effect on cosmic rays 2. Magnetic storms 3. Huancayo, Peru.**—*Author's abstract.*

7D–118 551.521.64:546.7

Korff, Serge A. (*New York Univ.*), **Effects of the cosmic radiation on terrestrial isotope dis tribution.** *American Geophysical Union, Transactions,* 35(1):103–106, Feb. **1954.** 5 refs., 6 eq **DWB**—The effects of cosmic radiation in building up and altering the terrestrial isotope distributio are computed. The most striking effect is the production of radio-carbon, but as this beta decay to nitrogen it does not alter the distribution permanently. The second important process is th production of tritium, and its subsequent decay into helium three. The problem is discusse quantitatively. Finally, it is shown that several other possible reactions do not contribute in a important degree to the existing distribution. *Subject Headings:* **1. Cosmic ray effects 2. Isotop distribution.**—*Author's abstract.*

7D–119 551.521.64:550.38

Linquist, S. (*Royal Inst. of Techn. Stockholm*), **A note on the variation of cosmic ray intensit produced by an electric field.** *Tellus,* 6(3):260, Aug. **1954.** fig., 3 refs., eqs. **DLC**—During magnetic storm the cosmic ray intensity I varies due to polarized beams of particles from sun Decrease in I due to a change in the earth's electric potential corresponds to a change of partic energy $= \Delta w$. The result is valid for any direction. The change in intensity shown is considerabl lower than that given by B. TRUMPY in *Physica XIX*, p. 645, **1953.** *Subject Headings:* **1. Cosm ray variations 2. Geomagnetic effects on cosmic rays.**—*M.R.*

7D–120 551.521.6

Linsley, John (*Univ. of Minnesota*), **A Čerenkov counter-cloud chamber measurement o multiply-charged primary cosmic rays.** *Physical Review,* 93(4):899–900, Feb. 15, **1954.** fig 3 refs. **DWB**—Results were obtained during a skyhook balloon flight (at 55°N geomagnetic lat which remained at a constant level of 16.4 mb for nearly 6 hrs. Pressure varied <0.3 mb from mea value during that period. Flux of fast (He) particles ($Z \gtrsim 2$) was determined from 62 of 157 photo graphs made at flight altitude. One particle was stopped by 4th copper plate ($Z \gtrsim 7$) so had energ

>350 Mev/nucleon when it entered the counter. *Subject Headings:* **1. Skyhook balloon cosmic ray observations 2. Constant level balloon flights 3. Cosmic ray photographs 4. Helium particles.**—*M.R.*

7D–121 551.521.64:537.591.1

Lovati, A.; Mura, A.; Succi, C. and Tagliaferri, G., **A cloud chamber analysis of cosmic radiation at 3500 m, Pt. B, Results on the hard and soft components.** *Il Nuovo Cimento*, Bologna, 12(4):526–538, Oct. 1, **1954.** 4 figs., 3 tables, 20 refs., 10 eqs. Italian summary p. 537–538. **DWB**—A multiple cloud chamber has been operated at 3500 m a.s.l., yielding 16,000 photographs of random expansions. The present paper is intended to investigate some questions pertaining to the general cosmic ray phenomenology. In particular, the zenith angle dependence of the directional intensities of both hard and soft component is found to follow a squared cosine law. In the range 0.3–2 GeV, the differential energy spectrum of the soft component is shown to be well represented by a power law with exponent −2.5. The rate of production of nuclear disintegrations in lead and the correlation between the disintegrations and other events are examined. (For Pt. A, *see* 7C–125, March 1956, *MAB.*) *Subject Heading:* **1. Cosmic radiation.**—*Authors' abstract.*

7D–122 551.521.64

†McClure, G. W. (*Franklin Inst., Swarthmore, Pa.*), **Composition of the primary cosmic radiation at $\lambda = 10°$N.** *Physical Review*, 96(5):1391–1400, Dec. 1, **1954.** 8 figs., 3 tables, 25 refs. **DWB**—A balloon-borne instrument comprising a fast ionization chamber interposed in a G-M counter train has been flown near the geomagnetic equator for the purpose of determining the fluxes of protons and He nuclei in the primary cosmic radiation. The apparatus measures the specific ionization of each particle that traverses the telescope, and contains a shower detector to aid in the identification of multiple-particle events of either local or external origin. Under the assumption that all telescope coincidences resulted from particles incident within the counter-defined solid angle, the total vertical flux, extrapolated to the "top of the atmosphere," is $I_{total} = 260$ sterad^{-1} m^{-2}. The "top"-extrapolated fluxes of primary protons and He nuclei deduced from the ionization distributions recorded at various depths (17 g/cm^2 and greater) are as follows: $I_H < 145$ sterad^{-1} m^{-2} sec^{-1}; $I_{He} < 38$ sterad^{-1} m^{-2} sec^{-1}. The large difference between I_{total} and $(I_H + I_{He})_{max}$ is believed to arise from air showers and/or nuclear events produced by particles incident from outside the telescope solid angle. The consequences of neglecting these spurious effects interpreting counter-telescope measurements are discussed, with particular reference to influences on the deduced form of the primary-proton energy spectrum, and the total energy flux associated with the primary radiation. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray energy balance.**—*Author's abstract.*

7D–123 551.521.64

Maeda, Kaichi and Wada, Masami, **Atmospheric temperature effect upon the cosmic-ray intensity at sea level.** *Tokyo. Scientific Research Institute, Journal*, 48:71–79, June **1954.** 3 figs., 1 table, 30 eqs., 15 refs. **DWB**—In order to illustrate the influence of atmospheric temperatures upon the cosmic ray intensity observed at sea level, the coefficients are calculated as a function of energy and altitudes by using the energy spectrum of cosmic ray mesons. It is shown that the atmospheric temperature effect is expressed by two terms: 1) ordinary temperature effect due to the decay of mesons and 2) positive temperature effect due to the variation of μ meson production rates. The latter effect increases with energy and becomes predominant in the upper atmosphere, while the former decreases with energy. In addition, the coefficient of partial temperature effect is defined and explained. *Subject Heading:* **1. Temperature effects on cosmic rays.**—*Author's abstract.*

7D–124 551.521.64

†Mather, K. B. (*Australian Atomic Energy Commission, Univ. of Melbourne*), **Measurements of the cosmic ray neutron rate in the Himalayas and Australian Alps.** *Australian Journal of Physics*, Melbourne, 7(4):601–614, Dec. **1954.** 3 figs., 3 tables, 21 refs., eqs. **DWB**—The variation of α-track density in boron-loaded emulsions and the star rate in C2 emulsions have been measured at the same sites at mountain altitudes at two latitudes. The α-count is proportional to the slow neutron density in the atmosphere while the stars arise chiefly from fast neutrons. The variation with altitude can be represented in each case by a simple exponential of the form: $I = I_{0_e}{}^{-x/L}$. Values were derived for the attenuation length L for each latitude: geomagnetic lat. 21°N, $L = 148$ (slow neutrons), 139 (stars); geomagnetic lat. 45°S, $L = 141$ (slow neutrons), 130 (stars). The close resemblance and direction of variation of L values for neutron flux and star rates is evidence for their generic connection. The latitude variation of L is less than observed in the upper half of the atmosphere. L values are also somewhat smaller than measured at higher altitudes, consistent with a degradation of the nucleon component with increasing atmospheric depth. The star rate in the

atmosphere has been calculated to be ~1.3 stars cm^{-2} sec^{-1} at geomagnetic latitude 45°S. *Subject Headings:* **1. Cosmic ray neutrons 2. Cosmic ray variations.**—*Author's abstract.*

7D–125 551.521.64

Meyer, Peter and Simpson, J. A. (*Inst. for Nuclear Studies, Chic. Univ.*), **Changes in amplitude of the cosmic-ray 27-day intensity variation with solar activity.** *Physical Review*, 96(4):1085–1088, Nov. 15, 1954. 2 figs., 3 tables, 13 refs. **DWB**—Both cosmic ray neutron and ionization chamber intensity observations reveal that the amplitude of the 27-day recurring intensity variation has been changing over an interval of several years. A method for studying this phenomenon using ionization chamber data for the period 1936–1946 and neutron intensity data for 1951–1953 is described which not only selects preferentially the 27-day variations but also selects the variations which are world-wide. The amplitude of the 27-day intensity variation over these years displays minima and a maximum closely related in time to the minima and maxima of the approximately 11-year cycle in general solar activity. Thus, these results provide additional, and independent, evidence that solar active regions are responsible for producing the mechanism which controls the 27-day cosmic ray primary intensity variations. *Subject Headings:* **1. Cosmic ray variations 2. Solar effects on cosmic rays.**—*Authors' abstract.*

7D–126 551.521.64

Miller, Charles E.; Henderson, Joseph E.; Garrison, Gerald R. et al., **Cosmic-ray protons at 3.4 kilometers.** *Physical Review*, 94(1):167–173, April 1, **1954.** 6 figs., 2 tables, 15 refs. **DWB**—A magnetic cloud chamber and an appropriate arrangement of coincidence and anticoincidence Geiger counters were used to photograph tracks of charged particles with ranges of 0.4 to 15 cm to 30 cm of lead. The momentum intervals corresponding to these range intervals are sufficiently different for proton ionization losses. A higher momenta, most of the protons were stopped by nuclear interaction because of large thicknesses of absorber used. At lower momenta, where both protons and mesons were stopped, the protons were distinguished by track density. The result is an accurate proton momentum spectrum for the interval 0.7 to 2.0 Bev/c, in which it is found that protons form 20 ± 2 percent of all ionizing nonelectronic particles. From the number of protons stopped in 15 and 30 cm of lead the path length for removal of protons in lead by nuclear interaction is calculated to be 206 ± 30 g/cm^2 in the momentum interval 0.9 to 2.5 Bev/c. *Subject Headings:* **1. Protons 2. Cosmic ray penetration. I. Potter, David S. II. Sandstrom, Wayne M. III. Todd, Jay, Jr.**—*Authors' abstract.*

7D–127 551.521.64

Miller, Charles E.; Henderson, Joseph E.; Potter, David S. et al., **The zenith angle dependence of cosmic-ray protons.** *Physical Review*, 93(3):590–595, Feb. 1, **1954.** 4 figs., table, 16 refs. **DWB**—The proton spectrum for particles in the momentum band 0.4–1.0 BeV/*c* and the meson spectrum for particles in the momentum band 0.09–0.34 BeV/*c* at zenith angles 45°E, vertical and 45°W have been obtained at 3.3-km elevation and magnetic latitude 48°N. The zenith angle dependence of protons, along with a simplified analysis, is presented as data on the nucleonic cascade. It is found that the gross zenith angle dependence will fit a $\cos^{3.2}\theta$ distribution at 45°E and W, there being no statistically significant East-West asymmetry. The simplified calculation assumes that a unidirectional component of the primary radiation will (1) suffer exponential absorption along its original path with a path length for removal of 120 g/cm^2 of air and (2) acquire an ultimate distribution at 3.3 km due to scattering fitting a $\cos^n \omega$ law, n being an adjustable parameter. It is found that a value of n of 6.5 ± 0.7 yields a unidirectional distribution which, when integrated over all angles, results in a gross zenith angle dependence agreeing with $\cos^{3.2}\theta$. The $\cos^n \omega$ distribution with n equal to 6.5 is quite sharp and leads to the conclusion that the average projected scattering angle per collision is only about 6 degrees. *Subject Headings:* **1. Zenith angle distribution of cosmic rays 2. Protons. I. Todd, Jay, Jr. II. Sandstrom, Wayne M. III. Garrison, Gerald R. IV. Davis, William R. V. Charbonnier, Francis M.**—*Authors' abstract.*

7D–128 551.521.64:551.500

*Miyazaki, Yukio, **Cosmic-ray records of the Scientific Research Institute.** *Tokyo. Scientific Research Institute, Journal*, 48:80–102, June **1954.** 8 figs., 6 tables, 3 eqs. **DWB**—The observation of the intensity of cosmic rays, which have been continuously performed at the Institute, is reviewed. The description of a cosmic ray meter and the method for reduction of data are given. The results which were obtained during the period from 1952 to 1953 are compiled, together with the graphical representation of monthly average intensity, daily variation and 27-day recurrence tendency of cosmic rays. *Subject Headings:* **1. Cosmic ray variations 2. Cosmic ray intensity 3. Tokyo Japan.**—*Author's abstract.*

7D–129 551.521.64

†Morrison, Philip; Olbert, Stanislav and Rossi, Bruno, **Origin of cosmic rays.** *Physical Review*, 94(2):440–453, April 15, **1954.** 3 figs., 2 tables, 27 refs., 46 eqs. **DWB**—The isotropy and composition of the primary cosmic radiation suggests that cosmic rays are trapped within the galaxy for an average time of the order of 10^8 years—a long time compared with the time of escape along straight-line paths, but short compared with the mean life against nuclear collisions with interstellar matter. If one accepts this conclusion, it appears possible to account for the observed properties of cosmic rays under the assumption that cosmic rays acquire their large energies through gradual acceleration in space, such as suggested by FERMI. In contrast to the original FERMI theory (which denied any possibility of escape from the galaxy), we now find that the energy spectra of protons and heavier nuclei are approximately the same, and that the required injection energies are very modest for all components. We are obliged, however, to assume a much faster rate of acceleration than the original theory required. In this paper the consequences of the above assumption are developed in some detail on the basis of a specific model, describing the motion of cosmic rays through the galaxy as a random motion between scattering centers represented by moving magnetized clouds. The astrophysical implications of these assumptions and the plausibility of the model are briefly discussed. *Subject Headings:* **1. Cosmic ray origin 2. Cosmic ray theory.**—*Authors' abstract.*

7D–130 551.521.64:537.59

Nevin, T. E., **High energy accelerators, cosmic rays and electrical processes in gases.** *Nature*, London, 173(4415):1127–1129, June 12, **1954.** **DWB**—Account of meeting of March 30–April 1, 1954. Several papers discussed problems of particle accelerators. Under cosmic radiation papers were read on the use of stacks of stripped emulsion and of the diffusion cloud chamber in tracking heavy unstable particles, on mass-measurement, on the energy spectrum of μ mesons, on air showers, sources of radiation, etc. Another group of papers dealt with excitation and collision processes, including production and persistence of N atoms in discharge tubes and the upper atmosphere. *Subject Heading:* **1. Cosmic ray showers.**—*C.E.P.B.*

7D–131 551.521.64

†Olbert, Stanislaw (*M.I.T., Lab. for Nuclear Sci.*), **Production spectra of cosmic-ray mesons in the atmosphere.** *Physical Review*, 96(5):1400–1407, Dec. 1, **1954.** 6 figs., 2 tables, 20 refs., 8+eqs. **DWB**—Recent experimental data on the differential vertical intensities of μ mesons in the atmosphere make it possible not only to improve the original SANDS' production spectrum of μ mesons but also to study is dependence on the geomagnetic latitude. It is shown that, for the residual ranges, R', between 100 g cm^{-2} and 6000 g cm^{-2}, the production spectrum may be approximately by an empirical formula of the type: $C(a+R')^{-\gamma}$, where C and γ are numerical constants practically independent of the geomagnetic latitude. The latitude dependence of the production spectrum is thus expressed through the parameters a which displays a monotonic decrease with increasing latitude. With numerical values of a, C, and γ compatible with experimental data, the production spectrum of μ mesons is then used as a basis for the derivation of the differential and integral energy spectra of charged π mesons. The latitude dependence of the π-meson spectrum is linked to the geomagnetic cut-off of the primary cosmic radiation, which leads to some crude conclusions on the average multiplicity of π mesons produced in proton collisions with air nuclei. In particular, the dependence of the multiplicity on the primary energies between 2 and 13 Bev is studied in detail and compared with FERMI's statistical theory of meson production. *Subject Headings:* **1. Meson production 2. Cosmic ray spectrum.**—*Author's abstract.*

7D–132 551.521.64(02)

†**Progress in cosmic ray research, Vol. 1–2,** ed. by John Graham Wilson, Amsterdam, North-Holland Pub. Co., **1952, 1954.** 557 and 322 p. figs., tables, eqs. bibliogs. throughout. **DLC**—Besides the highly technical reviews on various aspects of cosmic ray or nuclear physics, Ch. IV gives a thorough analysis of discoveries to date on **The nature of primary cosmic radiation** by B. PETERS (of Univ. of Rochester); Chap. V **on recent data on geomagnetic effects** (latitude, longitude) and atmospheric effects by H. V. NEHER of Caltech; Ch. VI on **The equilibrium of the cosmic ray beam in the atmosphere** by G. Puppi (Padua Univ.) and N. DALLAPORTA (Naples Univ.); Ch. VII, **Observations of cosmic rays underground and their interpretation,** by E. P. GEORGE (London Univ.), and Ch. VIII on **Time variations of cosmic ray intensity** (atmospheric temperature, seasonal, solar daily, sidereal daily, magnetic storm, etc.) by H. ELLIOT (of Manchester Univ.). Vol. II contains a comprehensive chapter (III) on **The penetrating component of cosmic radiation in the upper atmosphere** (latitude-intensity-depth-temperature relations) by E. G. DYMOND (Edinburg Univ.). Extensive bibliographies are included at the end of each chapter with appropriate reference citations in the text. At the end of Vol. I (p. 515–548) is an author bibliography of hundreds of items on work up to 1950. In Vol. II (p. 289–315) is an equally extensive author bibliography consisting

mostly of 1950–52 literature. *Subject Headings:* **1. Cosmic ray textbooks 2. Cosmic ray bibliographies. I. Wilson, John Graham** (*ed.*).—*M.R.*

7D–133 551.521.64:537.591.5

Quercia, I. F. and Rispoli, B., **Geomagnetic effects of the μ meson component of cosmic radiation at sea level.** *Il Nuovo Cimento*, Bologna, 12(4):490–518, Oct. 1, **1954.** 9 figs., 16 tables, refs. Italian summary p. 518. **DWB**—In order to investigate processes of creation of mesons by primary radiation and the hypothetical presence of negative particles in the primary radiation, two experiments have been carried out at high latitude (Rome, 42°) and low latitude (Bombay, 9°): 1) "charge excess experiment"; 2) "absorption spectrum experiment" under water and in the open air. The East-West asymmetry, the latitude effect, the charge excess have been studied as a function of zenithal angle. Some of our conclusions are the following: a) the measured negative excess in the eastern direction can be explained without introducing the hypothesis of negative primary particles; b) the energy dependence of the positive excess is not in contradiction with HEITLER's theory; c) the latitude effect is about 15% in the vertical direction for mesons of energy greater than 0.5 GeV and seems to increase in the eastern direction, and to decrease in the western direction with increase of zenithal angle; d) the ratio between the energy of the created mesons and the energy of the protons is of the order of 0.2. *Subject Headings:* **1. Meson production 2. Geomagnetic effects on cosmic rays.**—*Authors' abstract.*

7D–134 551.521.64

Reiffel, L. and Burgwald, G. M. (*Armour Res. Foundation of Illinois Inst. of Tech., Chicago*), **Low-energy events in cosmic radiation.** *Physical Review*, 95(5):1294, Sept. 1, **1954.** fig., 3 refs. **DWB**—The intensity of low-energy events in the cosmic radiation has been examined as a function of altitude with an energy gated scintillation counter. Events selected were those giving pulses the equivalent of 0.2-Mev to 2.0-Mev electron energy lost in the scintillation crystal. Compared with data for total radiation, the present results show a shift toward lower altitudes by an almost constant fraction of a radiation length. *Subject Headings:* **1. Cosmic ray spectrum 2. Cosmic ray intensity.**—*Authors' abstract.*

7D–135 551.521.64:537.59

Rosen, Arthur Z. (*Santa Barbara College, Univ. of Calif., Santa Barbara*), **Proton intensities at sea level and 9000 feet.** *Physical Review*, 93(1):211–214, Jan. 1, **1954.** fig., 4 tables, foot-refs. **DWB**—The vertical intensities of protons which occur singly in the cosmic radiation have been measured at 9000 ft and at sea level. The particles observed were those whose momenta, recorded by cloud chambers above and below a magnetic field, were between 0.59 and 0.93 Bev/c after having traversed various thicknesses from 0 to 345 g/cm² of lead absorber placed over the apparatus. The identification of the particles was achieved by a mass determination based on the measured momentum and the range observed in a third cloud chamber containing copper plates. With no absorber over the apparatus, the differential momentum intensity at 9000 ft was found to be $8.9 \pm 0.9 \times 10^{-4}$ $(\text{Bev/c})^{-1}$ sec^{-1} sterad^{-1} cm^{-2}. In conjunction with the data obtained at sea level with the same apparatus, an effective absorption length of 136^{+13}_{-8} g/cm² of air was found for protons of the mean momentum 0.76 Bev/c. From this absorption length and the evidence that production between the two levels of observation plays a predominant role, a value of 134 g/cm² for the absorption length of the primary particles was deduced. *Subject Headings:* **1. Cosmic radiation 2. Proton intensity.**—*Author's abstract.*

7D–136 551.507.362:551.521.64

Ross, Malcolm D. (*U. S. N. R.*), **The Deacon—pioneer in Arctic space.** *Aero Digest*, Wash., D. C., 69(2):26–28, Aug. **1954.** photos. **DWB**—The Skyhook balloon of the U. S. Navy and the Deacon rocket which can be fired from the Skyhook balloon at 70,000 ft from where it ascends to about 300,000 ft are described and illustrated. The manner of launching the combined equipment is also illustrated. The chief use of the Deacon is for obtaining cosmic ray data, but meteorological data may also be obtained. *Subject Headings:* **1. Skyhook balloons 2. "Deacon" rockets 3. Rocket measurement of cosmic rays.**—*M.R.*

7D–137 551.521.64:551.594.221

Schindelhauer, F. (*Potsdam*), **Zum Verhalten der Höhenstrahlung bei Gewittern.** [The behavior of cosmic radiation during thunderstorms.] *Zeitschrift für Meteorologie*, 8(7/8):255–256, July/Aug. **1954. DWB**—It was found that before the formation of a lightning discharge the frequency of counter impulses was from 16 to 84 coincidences per min. and after the first lightning stroke it returned to normal. *Subject Headings:* **1. Atmospheric effects on cosmic rays 2. Lightning discharges.**—*I.L.D.*

7D–138 551.521.64

Sekido, Yataro; Yoshida, Sekiko and Kamiya, Yoshiko (*all, Physical Inst., Nagoya Univ.*), **nisotropy of cosmic rays observed with an alt-azimuth telescope.** *Journal of Geomagnetism and oelectricity*, Kyoto, 6(1):22–33, March **1954.** 19 figs., 2 tables, 4 refs. **DLC**—Intensity distribuon of cosmic rays over the celestial sphere was scanned with an alt-azimuth counter telescope of arrow angular resolution, kept nearly horizontal so that the effective cosmic ray particles were ee from complicated geomagnetic deflection. The result suggests the existence of narrow anisoopic, i.e., something like point sources. The charge and the average momentum of the cosmic ray articles, with which the narrow anisotropes were distinguished, were observed to be positive and Störmers, respectively. *Subject Headings:* **1. Directional measurement of cosmic rays 2. Cosmic ay origin.**—*Authors' abstract.*

7D–139 551.521.64:551.524.7

Sherman, Noah (*H. M. Randall Lab. of Physics, Michigan Univ.*), **Atmospheric temperature ffect for μ mesons observed at a depth of 846 m.w.e.** *Physical Review*, 93(1):208–211, Jan. 1, **1954.** g., table, refs. **DWB**—The experiment reported was a measurement of the effect of variations in tmospheric temperatures on the intensity of μ mesons observed underground at a depth of 846 m.w.e. The average energy of these particles is known to be $\sim 2 \times 10^{11}$ ev. A total of $\sim 1.2 \times 10^{6}$ coincidences, between two large trays of Geiger counters located in a salt mine, was collected over two-year period. The correlation between variations in counting rate and simultaneous variations n effective atmospheric temperature was analyzed. The effective temperature was determined rom radiosonde measurements of atmospheric temperatures at pressure levels up to 20 mb performed by a U. S. Air Force weather observation unit near the salt mine. The resulting temperature oefficient is $0.22 \pm 0.06\%$/degree and the correlation coefficient is 0.75. The results are compared with those obtained from similar measurements at 1574 m.w.e. and with the theoretical values of the emperature coefficient derived from various schemes describing the production of μ mesons with high energies. *Subject Heading:* **1. Temperature effects on cosmic rays.**—*Author's abstract.*

7D–140 551.521.64

*†Simpson, J. A., **Cosmic radiation intensity-time variations and their origin, Pt. 1, Neutron ntensity variation method and meteorological factors.** *Physical Review*, New York, 90(5):934–950, June 1, **1953.** 13 figs., 3 tables, refs. Also: Fonger, William H., **Pt. 2, Energy dependence of 27-day variations.** *Ibid.*, 91(2):351–361, July 15, **1953.** 8 figs., refs., 35 eqs. Also: Simpson, J. A., **Pt. 3, The origin of 27-day variations.** *Ibid.*, 94(2):426–440, April 15, **1954.** 12 figs., 3 tables, 25 refs. Also: Firor, John, **Pt. 4, Increases associated with solar flares.** *Ibid.*, 94(4):1017–1028, May 15, **1954.** 10 figs., 4 tables, 38 refs., 5 eqs. Also: Firor, J.; Fonger, W. H. and Simpson, J. A., **Pt. 5, The daily variation of intensity.** *Ibid.*, p. 1031–1036. 10 figs., table, 21 refs. **DLC**—A continuously operating network of piles is established from 0–52°N and 75–106°W, with additional use of airborne piles. Meteorological effects which may interfere with the measurements (especially pressure and temperature, but also snow and ice deposits, rainfall, etc.) are analyzed in some detail. The large pressure coefficient is essentially independent of the geomagnetic latitude for atmospheric depths $\gtrsim 600$ g cm^{-2}. The upper limit of the temperature coefficient is ~ 0.1 for charged particle detectors. 27-day variations of primary cosmic ray intensity are believed to be produced by an accelerating mechanism probably controlled by solar processes. Increases related with solar flares are also analyzed. *Subject Headings:* **1. Pressure effects on cosmic rays 2. Temperature effects on cosmic rays 3. Cosmic ray variations 4. Cosmic ray data 5. Solar effects on cosmic rays.**—*A.A., G.T.*

7D–141 551.521.64

Singer, S. F. (*Maryland Univ.*), **Lectures on the primary cosmic radiation.** *Il Nuovo Cimento*, Bologna, Ser. 9, Supplement, 11(2):369–376, **1954.** 2 figs., 10 refs. **DWB**—A review of the present knowledge of primary cosmic radiation (at the top of the earth's atmosphere), including composition (charge spectrum) of the primary radiation, energy spectrum, geomagnetic theory, latitude cut-off (knee), diurnal variation and the problem of the forbidden origin. Diurnal variation is $<1\%$ (recent experiments indicate greater variation) which argues against forbidden regions, but since interplanetary field is not a perfect dipole and is often disturbed, a large variation would not be expected. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray diurnal variations 3. Cosmic ray theory.**—*M.R.*

7D–142 551.521.64

†Sitte, Kurt; Stierwalt, Don L. and Kofsky, Irving L., **Development of air showers in the atmosphere.** *Physical Review*, 94(4):988–993, May 15, **1954.** 3 figs., 2 tables, 26 refs. **DWB**—An experiment was carried out at Mt. Evans, Colorado (altitude 4300 m) to study the development of extensive air showers in the atmosphere. Showers with cores striking near a cloud-chamber-

hodoscope arrangement were selected, and the differential energy spectrum of the shower particles determined by observing their transition effect in six $\frac{1}{2}$-in. lead plates with a 68-counter hodoscope. Each shower can be assigned an age classification on the basis of this energy spectrum. The lateral structure function between 2 m and 8 m from the core was obtained from measurements of the particle densities at four extension trays containing 50 counters with a total area of 1.34 m^2. It was found from the hodoscope data that the lateral structure function of the showers of various ages does not agree well with the predictions of the single-particle cascade theory. The observed structure function for showers at and beyond the cascade maximum is less steep than expected near the axis; this is consistent with multiple production of shower-producing particles in the primary collision. It was also found that the lateral distribution of showers past the cascade maximum varies only slowly with age; this tendency is predicted in a general way by the cascade theory, but only at a much later stage of development than observed and with quite a different slope of the distribution curve. The interpretation of this effect as the result of a "rejuvenation" of the shower by the continuous transfer of energy from the nucleonic cascade to the electron cascade is therefore more likely. *Subject Headings:* **1. Cosmic ray shower production 2. Mt. Evans, Colo.**—*Authors' abstract.*

7D–143 551.521.64:523.165

†Teller, Edward, **Theory of origin of cosmic rays.** *Physical Society of London, Reports on Progress in Physics*, 17:154–172, **1954.** fig., 33 refs., 21 eqs. **DWB**—Primary cosmic rays are protons with some heavier nuclei. A soft minor component originates in the sun, generated by a stepwise acceleration in magnetic fields in a conducting gas; acceleration in electric fields is ruled out. The acceleration is attributed to rapidly moving but weak magnetic fields in the corona associated with sunspots and prominences, giving velocities high enough to be transformed into low energy cosmic rays by further random accelerations. They are associated with radar waves of a few meters wavelength, and it is argued that high energy cosmic rays come from masses of gas expelled from radio stars in our own galaxy, especially near the core of the Milky Way, the trapped magnetic energy being transformed into kinetic energy. Cosmic radiation has been constant for the past 10–20 thousand yrs but it is possible that great jumps in biological evolution may have been due to temporary increases in geological times. *Subject Heading:* **1. Cosmic ray theory.**—*C.E.P.B.*

7D–144 551.521.64:523.75

Treiman, S. B. (*Princeton Univ., Physical Lab.*), **Magnetic moment and cosmic-ray effects associated with solar flares.** *Physical Review*, 94(4):1029–1030, May 15, **1954.** 8 refs., eq. **DWB**—A close correlation between solar flares and small cosmic ray intensity increases has recently been established by the Climax, Color, neutron monitor data. The correlation, however, is restricted only to those flares which occur when the station lies within a certain interval of local solar time. This has been explained by supposing that the new cosmic ray particles approach the earth preferentially along the earth-sun line, before deflection in the terrestrial magnetic field takes place. In the present paper, this evidence is used to establish an upper limit to a possible solar magnetic dipole field. Allowance is made for the fact that the dipole field may be seriously perturbed by local fields near the sun; but on the assumption that the dipole field predominates far from the sun (at distances greater than one-fifth the earth-sun distance), the upper limit on the solar dipole moment is 5×10^{32} gauss-cm^3. *Subject Headings:* **1. Solar flare effects on cosmic rays 2. Climax, Colo.**—*Author's abstract.*

7D–145 551.521.64

Tsai, Chü and Morand, Max, **Sur l'intensité totale et les spectres différentiels des moments de la composante nucléaire du rayonnement cosmique au voisinage de l'équateur observés au moyen d'une émulsion sensible.** [Total intensity and differential energy spectra of the nuclear component of cosmic radiation near the equator observed by means of a sensitive emulsion.] *Académie des Sciences, Paris, Comptes Rendus*, 239(5):415–418, Aug. 2, **1954.** 2 figs., 2 tables, 7 refs. **DWB**—In the angular spectral energy distribution of slow protons there appears a secondary maximum at low energies. The effect of latitude is approximately half as big for protons as it is for neutrons. *Subject Headings:* **1. Cosmic ray nucleon distribution 2. Cosmic ray spectrum.**—*Trans. of authors' abstract.*

7D–146 551.521.64

Wada, Masami and Kudo, Shoko, **Relation between cosmic-ray intensities and heights of isobar levels, Pt. 2. On the positive temperature effect.** *Tokyo. Scientific Research Institute, Journal*, 48(1,370):245–259, Dec. **1954.** 7 figs., 5 tables, 21 refs., 14 eqs. **DWB**—The positive relation between the intensity of cosmic rays observed at sea level and the temperature at around 100 mb level is investigated. Existence of this relation and several suggestions such as those proposed by Trefall and Olbert for the interpretation of it are verified. The latters are, however, not enough

or thorough explanation of the relations. Some results on ordinary barometer and temperature effects are also described. *Subject Headings:* **1. Pressure effects on cosmic rays 2. Temperature effects on cosmic rays.**—*Author's abstract.*

7D–147 551.521.64

Yoshida, Sekiko (*Physical Inst., Nagoya Univ.*) and Kondo, Ichiro (*Scientific Research Inst.*), **On the 27-day recurrence on the cosmic-ray diurnal variation.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 6(1):15–21, March **1954.** 5 figs., 14 refs. **DLC**—Twenty-seven day recurrence of the cosmic ray diurnal variation was found from the analysis of the data observed at Huancayo during the period 1936–1940. Similar analysis was done on the daily mean values of cosmic ray intensity and geomagnetic activities. Among them the recurrence of the cosmic ray diurnal variation was the most persistent, and that of the daily mean cosmic ray intensity was the next. It was suggested that the most of the cosmic ray diurnal variation may be interpreted as the storm effect. *Subject Heading:* **1. Cosmic ray diurnal variations.**—*Authors' abstract.*

1955

7D–148 551.521.64:92

Allison, S. K.; Segrè, Emilio and Anderson, H. L., **Tributes to Enrico Fermi.** *Physics Today*, N. Y., 8(1):9–13, Jan. **1955.** ports. **DLC**—Three former students or associates of FERMI give warm praise of his scientific and human qualities which made him one of the greatest of modern scientists. They also review the history of his work on cosmic rays and discoveries in nuclear science leading to atomic fission. *Subject Headings:* **1. Biography 2. Cosmic radiation 3. Fermi theory.** —*M.R.*

7D–149 551.521.64

†Barker, Paul R. (*Dept. of Physics, Univ. Mich.*), **Cosmic-ray electrons near sea level and at mountain altitudes.** *Physical Review*, N. Y., 100(2):860–869, Nov. **1955.** 5 figs., 4 tables, 27 foot-refs. **DLC**—A cloud chamber containing aluminum and lead plates has been used to study the intensities and energies of cosmic ray electrons as a function of altitude and zenith angle. The energy distribution is found to be approximately independent of altitude and zenith angle. The decrease of electron intensity with zenith angle is found to be much less than has been reported by investigators using counter telescopes. The increase of the vertical intensity with altitude is found to be slightly smaller than previously reported. The numbers of electrons resulting from decay and collision processes of μ mesons have been calculated and subtracted from the observed numbers. The residual electrons have an exponential altitude dependence with an absorption length of 135 ± 15 g cm^{-2}, and a zenith angle dependence which is much less steep than would be expected if they preserved the directions of the primary particles from which they originate. *Subject Headings:* **1. Cosmic ray electrons 2. Zenith angle distribution of cosmic rays.**—*Author's abstract.*

7D–150 551.521.64 551.501.9:551.43

Chatterjee, S. D., **Symposium on high altitude research at Gulmarg.** *Science and Culture*, Calcutta, 21(1):29, July **1955.** **DLC**—Gulmarg Observatory is located at 23°32′N (geomag.) and 75°E at 9000 ft and serves as a base station for work at 11,000 ft at Khillan Marg (1 hr away) and at 14,000 ft at Apharvat (3 hrs away). The meeting, the first on high altitude research in India, was attended by meteorologists, chemists, cosmic ray physicists, biologists, etc. from all over India. Speakers included K. R. RAMANATHAN, S. K. MITRA and K. S. KRISHNAN. Seventy original papers were presented (to be published in the *Bulletin of the National Institute of Sciences of India*). *Subject Headings:* **1. High altitude research symposia 2. High altitude observatories 3. Gulmarg Observatory, Kashmir.**—*M.R.*

7D–151 551.521.64:537.59

Chaudhri, Rafi Mohammed; Qayum, Abdul and Farooqi, Afzal, **Anomalies in the cosmic-ray shower curves for lead.** *Nature*, London, 176(4488):876, Nov. 5, **1955.** fig., 4 refs. **DWB**—Experiments under a concrete roof 1′ thick at Lahore showed maxima in shower curves under 1–2, 14–15 and 24–25 cm lead. *Subject Headings:* **1. Penetrating showers 2. Lahore, Pakistan.**—*C.E.P.B.*

7D–152 551.521.64

Chou, C. N. and Schein, Marcel (*Univ. of Chicago*), **Cosmic-ray studies of penetrating showers and bremsstrahlung at 11,200 feet by using plastic scintillation counters.** *Physical Review*, New York, 97(1):206–212, Jan. 1, **1955.** 6 figs., table, 30 refs. Also their: **Scintillation counter study of energy spectra of cosmic-ray photons and electrons at 11,200 feet.** *Ibid.*, 98(1):162–164, April 1, **1955.** 3 figs., 16 refs. **DLC**—An apparatus used at Climax, Colo., for measuring cascade showers

initiated by high energy photons and electrons is described in detail. The apparatus essentiall consists of four plastic scintillators with interposed lead plates, used in conjunction with four tray of G-M counters and an arrangement of anticoincidence counters. Energy distribution spectra c the various components of penetrating showers are derived from over 10,000 recorded events. *Subje Headings:* **1. Cosmic ray showers 2. Cosmic ray instruments 3. Climax, Colo.**—*G.T.*

7D–153 551.521.6

Citron, A. and Kehler, P. (*Freiburg Univ., Institute of Physics*), **Untersuchung grosser Schaue auf Sternzeitgang.** [Sidereal time variations of extensive showers.] *Zeitschrift für Naturforschung Sec. A*, Tübingen, 10(6):499–501, June **1955.** 2 figs., table, 6 refs. **DLC**—A year's observations o great cosmic ray showers corrected for pressure (Oct. 1953–Oct. 1954) made at Schauinsland nea Freiburg im Breisgau (48°N, 8°E, 1230 m), are correlated with sidereal time, showing a minimum at 13h local sidereal time and a broad maximum, about 23h local sidereal time. The minimum coincides with the culmination of the poles of the Milky Way. The marked correlation does no occur with very high energy showers (1–5.10^{16} eV) according to results at Harwell, but with 10^{13} eV it does occur. Comparison with Pic-du-Midi and Southern Hemisphere results show good qualitativ agreement with these cosmic rays. *Subject Headings:* **1. Sidereal time relations of cosmic ray 2. Freiburg, Germany.**—*M.R.*

7D–154 551.521.64

Eugster, J. (*Univ. of Zurich*), **Über den Nachweis von schweren Primären der kosmischer Strahlung mittels einer Farbstoffmethode.** [On the detection of heavy primaries of cosmic radiation by means of a dye method.] *Astronautica Acta*, Vienna, 1(1):57–60, **1955.** 4 figs. (incl. photos) table. English and French summaries p. 57. **DBS**—It is successfully demonstrated, for the first time, that the big events in photographic plates, which are produced by cosmic radiation, can also be made detectable by means of dyes. This has the practical significance, that, henceforth, in biological research, it is no longer necessary to work with photographic plates, whose disadvantage lies in the so-called fading, the gradual disappearance of the tracks resulting from long delays between exposure and development. It will be possible in the future, with this method, to study the effect of cosmic rays in living tissue, even inside a single cell, e.g., in a direct hit with the nucleus and, thereby, to take into consideration the latent-periods which are so characteristic of all radiation damage. *Subject Heading:* **1. Cosmic ray measurement.**—*Author's abstract.*

7D–155 551.521.64:57.4(02)

†Eugster, Jakob (*Zürich Univ.*) et al., **Weltraumstrahlung.** [Cosmic radiation.] Bern, Hans Huber, **1955.** 141 p. 46 figs. and plates (some col.), 12 tables, 435+ refs. **DLC**—The primary object of this book is stated in its sub-title: **Present status of biological investigation of cosmic radiation at high altitudes and far underground, by latest research methods.** Current methods for investigating biological effects of cosmic radiation and results of such investigations (in balloons, jet airplanes, on Mt. Everest, Jungfraujoch, surface observations, Simplon tunnel) are reviewed. The effects considered in particular are those on mutations and on cancerous growth. Radiochemical effects of cosmic radiation are also discussed. The book also contains a review of the entire physical field of cosmic radiation. *Subject Headings:* **1. Cosmic ray textbooks 2. Biological effects of cosmic radiation.**—*G.T.*

7D–156 551.521.64

†Harris, Frank B., Jr. (*M.I.T., Lab. for Nuclear Science*) and Escobar Vollejo, Ismaél (*Univ. Mayor de S. Andrés, La Paz, Bolivia*), **East-west asymmetry of positive and negative mesons at the geomagnetic equator.** *Physical Review*, N. Y., Ser. 2, 100(1):255–268, Oct. 1, **1955.** 7 figs., 4 tables, 22 refs., 41 eqs. **DLC**—The intensities of positive and negative μ mesons at zenith angles of 45° in the East-West plane and at the vertical have been measured at atmospheric depths 548 g cm^{-2} near the geomagnetic equator. The data are analyzed through use of the empirical production spectrum and unidimensional equation for μ-meson production employed by SANDS and by OLBERT. A careful theoretical discussion is given, taking into account in detail the various effects arising both from the variation of the geomagnetic cutoff with direction of incidence of the primaries and from the curvature of the trajectories of the mesons in the earth's magnetic field after their production in the atmosphere. It is found that, to bring the 45° and vertical data into accord, it is necessary to assume an rms angle of production of the parent π mesons of 14°±2°. It is then possible to express the production spectrum, at any geographical location, by the single equation $G(R') = A\,[R' + a(M_c)]^{-n}$, where M_c is the cutoff magnetic rigidity for the primaries in a given direction of incidence at that location. The data do not indicate the presence of any appreciable number of negatively charged particles in the primary cosmic radiation. *Subject Headings:* **1. Cosmic ray asymmetry 2. Meson production.**—*Authors' abstract.*

7D–157 551.521.64

Heidmann, Jean, **Sur un schéma de théorie de l'origine des rayons cosmiques.** [Outline of a theory on the origin of cosmic radiation.] *Académie des Sciences, Paris, Comptes Rendus*, 240(5): 511–513, Jan. 31, **1955.** 6 refs. Also: **Sur une théorie de l'origine des rayons cosmiques.** [A theory of the origin of cosmic radiation.] *Ibid.*, 240(6):618–620, Feb. 7, **1955.** fig., 3 refs. **DWB**—According to the theory proposed in the two papers, cosmic rays are accelerated by the electromotive force induced in and near our galaxy by the Big Magellanic Cloud. On the basis of this theory the author estimates the probable energy of cosmic rays and finds it to be 10^2 eV, which appears to be in fair agreement with experimental values. *Subject Heading:* **1. Cosmic ray theory.**—*G.T.*

7D–158 551.521.64:537.591.1

Heisenberg, W., **Der gegenwärtige Stand der Theorie der Elementarteilchen.** [The present position of the theory of elementary particles.] *Naturwissenschaften*, 42(24):637–641, Dec. **1955. DWB**—An historical sketch is given of the attempts to formulate laws of elementary particles, including light quanta and electron showers in cosmic radiation. New experimental methods and theories developed from them are described, and future extensions suggested. *Subject Heading:* **1. Cosmic ray theory.**—*C.E.P.B.*

7D–159 551.521.64

Horwitz, Nahmin (*Dept. of Physics, Univ. of Minnesota*), **Čerenkov counter flux measurement of cosmic-ray alphas at 41°.** *Physical Review*, N. Y., Ser. 2, 98(1):165–172, April 1, **1955.** 14 figs., table, 15 refs., eqs. **DLC**—A Čerenkov counter inside a Geiger counter telescope was flown by balloon to a residual atmospheric depth of 16 g/cm². The purpose of the experiment was to measure the flux of cosmic-ray alpha particles and to investigate the usefulness of a Čerenkov counter for flux measurements on the more heavily charged cosmic ray components. A Čerenkov counter was used because of its inherent discrimination against slow secondary particles. The pulse height distribution obtained showed a partially resolved peak at approximately 4 h_0, where h_0 is the mean pulse height corresponding to a fast proton. This is experimental confirmation of the Z^2 dependence for Čerenkov radiation. There were 3024 events which gave pulse heights corresponding to alphas. There is evidence that 451 were due to side showers, 651 were due to nuclear interactions, an additional 478 were due to either side showers or interactions, and 1444 were due to primary alphas. This leads to the value 99 ± 16 particles/m²-steradian-second, as the extrapolated flux at the top of the atmosphere. There is also an indication of peaks corresponding to carbon and oxygen. There is evidence that the geometry factor of the telescope was appreciably increased for the heavy components due to the action of delta rays. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray measurement.**—*Author's abstract.*

7D–160 551.521.64

Husain, A. and Pickup, E. (*both Div. Physics, National Research Council, Canada*), **Mass spectrum of shower particles from cosmic-ray interactions.** *Physical Review*, N. Y., 98(1):136–139, April 1, **1955.** 4 figs., 9 refs. **DLC**—The masses of particles with an ionization less than about twice the minimum value emitted in cosmic ray stars in a photographic emulsion have been determined by observations on the grain density and scattering of suitably long tracks. About 100 tracks with an average length of 16.5 mm were analyzed using a single emulsion exposed to cosmic rays in a high altitude balloon flight of nine hours duration. The results show groups of pions, protons, deuterons, heavy mesons with mass $\sim 925 m_e$ and the possibility of a group with mass closer to that of the proton. This latter is uncertain, however, with the present resolution and could be a statistical fluctuation of the edge of the proton distribution. *Subject Heading:* **1. Cosmic ray showers at high altitudes.**—*Authors' abstract.*

7D–161 551.521.64:551.515.8

Jacklyn, R. M., **Cosmic rays and air mass effects at Macquarie Island.** *Australian Journal of Physics*, Melbourne, 8(1):190–192, March **1955.** fig., table, 3 refs., eqs. **DLC**—In this note the author gives results of an analysis of the various air mass types to show why the ratio of $\delta H/\delta B$ (rate of change of height of production level of mesons with surface pressure) varies as it does. Regression of H on B was calculated for 100, 200, 400, 600 and 800 mb from daily radiosonde flights at Macquarie Island. These are shown in table and on graph. (For fuller abstract, *see* 7.3–169, March 1956, *MAB.*) *Subject Headings:* **1. Air mass effects on cosmic rays 2. Macquarie Island.**—*M.R.*

7D–162 551.521.64:551.501.9:551.43

La Paz, Bolivia. Universidad Mayor de San Andres. Laboratorio de Física Cósmica, **Resumen de labores, año 1952, 1953, 1954.** [Report of activities, 1952, 1953, 1954.] Its *Cuaderno*, No. 1,

2, 3, June 1952, March 1954, March 1955. 69, 30 and 44 p. figs., refs. **DWB**—In these three reports, work (mostly on cosmic ray East-West asymmetry) done at the Cosmic Phy Laboratory at Chacultaya, Bolivia is reviewed. The observatory is located at 5200 m with auxil meteorological and cosmic ray photography buildings at 5300 and 5490 m. The work is direct by Prof. Escobar V. (editor of **Nimbus**). Cooperation of the Brazilian Center of Physical Resea the Bolivian Met. Service, M.I.T., the Univ. of Chicago, IGY, UNESCO and other groups is outlin The laboratory is open to workers associated with any scientific institution for research in cos rays. The first report includes two articles by I. Escobar V. and Frank B. Harris, Jr., on cos ray investigation and meson asymmetry (these were also published in modified form in *Nim* No. 3, 1952; *see items* 7C–109 and 7C–110, March 1956, *MAB*). *Subject Headings:* **1. Cosmic research 2. High altitude observatories 3. Annual observatory reports 4. Chacultaya, Boli I. Escobar V., I. II. Harris, Frank B., Jr.**—*M.R., G.T.*

7D–163 551.521.64:551.586

Life's radiation tallied. *Science News Letter*, 68(3):35, July 16, 1955. **DWB**—The radiat dosages that people receive from natural radioactivity and from cosmic rays are analyzed briefly discussed. Seafarers receive less than people living ashore. The dosage varies with vironment and altitude. It is shown that all figures are far below the 100,000 or more mr (m Roentgens) in one dose which must be absorbed by the body to cause radiation sickness or de For example, the total fallout dosage from atomic tests in 1954 was only about 15 mr. *Sub Headings:* **1. Cosmic radiation 2. Radiation effects.**—*W.N.*

7D–164 551.521.64:551.508

London. University College and Edinburgh. University, **The high-pressure cloud-cham cosmic-ray programme at La Marmolada.** *Nature*, London, 175(4454):445–448, March 12, 19 5 figs. **DWB**—A cloud chamber operating at a pressure of 75 atmospheres was set up at Univers of Padua Cosmic Ray Laboratory at 2020 m in the Dolomites. Construction and operation described. Three thousand photos have been analyzed and principal results are described. *Sub Headings:* **1. Cosmic ray measurement 2. High pressure cloud chambers.**—*C.E.P.B.*

7D–165 551.521

Luk'ianov, S. Iu., **Osnovnye predstavleniia eksperimental'noĭ iadernoĭ fiziki.** [The ba knowledge of experimental nuclear physics.] *Priroda*, Moscow, 44(3):11–31, March 1955. 13 fig table. **DLC**—In this thorough review of the history and development of knowledge of nucl physics, the important features of cosmic ray research and the methods used in this allied fi (cloud chambers, photography, basic particles, etc.) are reviewed chronologically. *Subject Headin* **1. Cosmic ray research 2. Nuclear physics.**—*M.R.*

7D–166 551.521.64:551.54

McCusker, C. B. A.; Dardis, J. G. and Wilson, B. G., **The rates of penetrating showers at s level.** *Physical Society of London, Proceedings, Ser. A*, 68(7):585–590, July 1, 1955. 4 figs., tables, 14 refs. **DWB**—Local penetrating showers at Dublin showed a statistically significa variation with solar time, maxima 4–5 h and about 17 h GMT. There was no obvious relation sidereal time. The solar variation was correlated with the small diurnal variation of pressu probably through pressure changes at high levels, the coefficient exceeding −10% per cm H Possible variations of extensive penetrating showers with both solar and sidereal time were fou but not confirmed. *Subject Headings:* **1. Cosmic ray penetration 2. Pressure effects on cosmic ra 3. Cosmic ray diurnal variations 4. Dublin, Ireland.**—*C.E.P.B.*

7D–167 551.521.

Meredith, L. H.; Gottlieb, M. B. and Van Allen, J. A. (*all Dept. of Physics, State Univ. of Iow* **Direct detection of soft radiation above 50 kilometers in the auroral zone.** *Physical Review*, N. Y 97(1):201–205, Jan. 1, 1955. 3 tables, 4 figs., 7 refs. **DLC**—In two high altitude rocket flights thin walled Geiger tubes at geomagnetic lat. 64° and 74°N, a considerable intensity of soft radiati has been encountered above 50 km altitude. No such radiation has been found in flights of identic equipment at 88.5° and 55.6°. The radiation is tentatively interpreted as the high energy tail the auroral spectrum. It may consist of electrons. *Subject Heading:* **1. Soft cosmic rays.**—*Author abstract.*

7D–168 551.521.64:537.

Meredith, L. H.: Van Allen, J. A. and Gottlieb, M. B. (*all, Iowa State Univ., Dept. of Physics* **Cosmic-ray intensity above the atmosphere at high latitudes.** *Physical Review*, N. Y., 99(1):19 209, July 1, 1955. 8 figs., 6 tables, 33 refs., 23 eqs. **DLC, DWB**—The total charged particle cosm ray intensity above the atmosphere has been measured with thin walled Geiger counters (tot

effective stopping power of apparatus and residual atmosphere 0.5 g/cm² of aluminum) carried in balloon launched rockets at geomagnetic lat., 54.3°N, 62.1°N, 71.9°N, and 86.7°N. The respective values of unidirectional particle intensity averaged over the upper hemisphere: $\bar{J}=0.44\pm0.01$, $\leq 0.50\pm0.05$, $\leq 0.50\pm0.05$, and $=0.48\pm0.01$ $(cm^2\ sec\ sterad)^{-1}$. These results are consistent with the complete or nearly complete absence of primary cosmic rays having a magnetic rigidity less than 1.7×10^9 volts. *Subject Heading:* **1. Primary cosmic rays 2. Cosmic ray intensity 3. Northern Hemisphere.**—*Authors' abstract.*

7D–169 551.521.64

Neuburg, H. A. C.; Soberman, R. K.; Swetnick, M. J. and Korff, S. A. (*all, N. Y. Univ.*), **High-altitude cosmic-ray neutron density at the geomagnetic pole.** *Physical Review*, N. Y., 97(5): 1276–1279, March 1, **1955.** 5 figs., 12 refs. **DLC**—Two successful balloon flights were launched near the geomagnetic North Pole, bearing low energy cosmic ray neutron detectors. The neutron maximum was found to occur at 75±5 mb. A value of 161 mb was found for the mean absorption depth, *L*. *Subject Headings:* **1. Cosmic ray neutrons 2. Geomagnetic poles 3. Arctic.**—*Authors' abstract.*

7D–170 551.521.64:537.591.1

Observations on heavy mesons and hyperons. *Nature*, London, 175(4466):971–973, June 4, **1955.** fig., table, 7 refs. **DWB**—Modes of decay of heavy mesons, and masses and modes of decay of hyperons, are summarized. A stack of 250 sheets of stripped emulsion, 37×27×15 cm, was carried by balloon over Italy for 6 hrs at 85,000–78,000 ft. About 80,000 *K* and *Y* particles are present in the stack. Modes of decay of mesons and hyperons are discussed. *Subject Headings:* **1. Cosmic ray hyperons 2. Cosmic ray mesons 3. Italy.**—*C.E.P.B.*

7D–171 551.521.64

Officer, V. C. and Eccles, P. J. (*both, Physics Dept., Univ. of Melbourne*), **Observations on the penetrating component of extensive air showers.** *Australian Journal of Physics*, Melbourne, 8(1):136–147, March **1955.** 4 figs., 2 tables, 24 refs. **DLC**—The variation in the composition of the penetrating component of extensive air showers at sea level has been investigated as a function of shower density. The proportion of N-particles in the penetrating component was observed to decrease as the shower density decreased. It is suggested that this behavior is due to the filtering action of the atmosphere on the more absorbable particles in the nuclear cascade which has passed maximum development. The zenith angle distribution of the penetrating μ-mesons in air showers has been found to be of the form $\cos^8\theta$ which is consistent with that expected for shower axes, and gives no evidence for the broader distribution reported at mountain altitudes. An anomalous deficiency of penetrating μ-mesons with zenith angles less than 5° has been found in air showers of median density 10 m^{-2}. *Subject Headings:* **1. Penetrating showers 2. Zenith angle distribution of cosmic rays.**—*Authors' abstract.*

7D–172 551.521.64:551.507.352

Ogilvie, K. W., **Proton component of cosmic rays at aircraft altitudes.** *Canadian Journal of Physics*, Ottawa, 33(9):555–564, Sept. **1955.** 8 figs., 5 tables, 15 refs., numerous eqs. **DWB, DLC**—Experiments with a heavy particle selector installed in an aircraft show that the proton intensity in the energy range 230 to 480 Mev has a variation with height which is exponential, with absorption length 128±10 gm/cm². The latitude effect between λ=40°N and λ=56°N is in general agreement with that found for fast (up to 5 Mev) neutrons. Some information has been obtained on the variation of the average specific yield for primary energies below 5 Bev. *Subject Headings:* **1. Cosmic ray variations 2. Airplane cosmic ray investigations 3. Cosmic ray protons.**—*Author's abstract.*

7D–173 551.521.64:537.591.8

Perkins, D. H., **Ionization at the origin of electron pairs, and the lifetime of the neutral pion.** *Philosophical Magazine*, London, 7 Ser., 46(381):1146–1148, Oct. **1955.** fig., 5 refs. **DWB**—Measurements of gap between electron pairs created by the materialization of a high energy photon, plotted for distances of 20–1000μ from pair origin, show a reduction of ionization for distances <300μ. The lifetime of the neutral pion is $1.2–5\times10^{-15}$ sec. *Subject Heading:* **1. Cosmic ray ionization.**—*C.E.P.B.*

7D–174 551.521.64

Pomerantz, Martin A. (*Bartol Res. Foundation, Franklin Inst., Swarthmore, Pa.*), **Latitude effect of cosmic radiation at low altitudes.** *Physical Review*, N. Y., 98(1):105–106, April, **1955.** fig., 2 tables, 6 refs. **DLC**—The latitude effect, $L=1-(N/(\lambda_2)/N(\lambda_1))$, where $N(\lambda_1)$ is the intensity at $\lambda_1>40°$ and $N(\lambda_2)$ is the intensity at low latitude λ_2, has been determined on the basis of absolute

and that the distribution of momentum loss along the path of the μ-meson depends on the air temperature. *Subject Headings:* **1. Cosmic ray variations 2. Temperature effects on cosmic rays.** *Author's abstract and C.E.P.B.*

7D–185 551.521.64:57

Tzschaschel, R. and Bergter, F., **Untersuchungen zur Wirksamkeit der kosmischen Ultrastrahlung (KS) auf Mikroorganismen.** [Investigations of the effectiveness of cosmic radiation on microorganisms.] *Naturwissenschaften*, 42(24):649, Dec. **1955.** fig., 2 refs. **DWB**—Effects of soft shower components on bacteria were examined under lead thickness up to 4.5 cm. It was greatest with about 1.5 cm. *Subject Headings:* **1. Biological effects of cosmic radiation 2. Microorganisms.**—*C.E.P.B.*

7D–186 551.521.

Van Heerden, I. J. and Thambyahpillai, T., **The 27-day recurrence tendency of cosmic ray intensity.** *Philosophical Magazine*, London, 46(382):1238–1251, Nov. **1955.** 10 figs., 2 tabl 8 refs. **DLC**—The 27-day recurrence tendency of the cosmic ray intensity has been studied for t nucleon, meson and electron components of the cosmic radiation and the amplitude of the variati is found to be greater for the nucleon component, furthermore the changes in cosmic ray intensi seem to precede those of magnetic activity by 4 or 5 days. The 27-day period corresponds to t time of rotation of the sun and this would seem to indicate that the cosmic ray intensity chang are associated with solar disturbances which, after a delay of several days, produce magnetic storm There is some evidence to show that the recurrence tendency is due to decreases in intensity whi occur at 27-day intervals. *Subject Headings:* **1. Solar effects on cosmic rays 2. Cosmic ray variations.**—*Authors' abstract.*

7D–187 551.521.

†Webber, William R. and McDonald, Frank B. (*both, Dept. of Physics. State Univ. of Iowa*) **Determination of the intensities of low-Z components of the primary cosmic radiation at $\lambda = 4$ using a Čerenkov detector.** *Physical Review*, N. Y., 100(5):1460–1467, Dec. 1, **1955.** 11 fig 5 tables, 14 refs., eq. **DLC**—A measurement of the intensities of the low-Z components of the p mary cosmic radiation has been made in the upper atmosphere at a depth of 13 g/cm² by means a "Skyhook" balloon flown at $\lambda = 41.5°$. The measuring instrument consisted of a thin (3.0 g/cm Čerenkov detector placed within the solid angle of a Geiger counter telescope. A Čerenkov detect was used because of its unique discrimination against slow particles. A system of guard and show counters and circuits was included to identify side showers and background events occurring in t detector. A vertical intensity of 82 ± 9 alpha particles/meter² steradian sec, at the top of the a mosphere was obtained, based on 374 counts attributed to alpha particles. Data obtained as t balloon rose to altitude gave a value of 43 ± 8 g/cm² for the apparent absorption mean free path alpha particles in air. An upper limit was set on the intensity of primary protons at this dept In addition, a small number of counts that could be attributed to particles with $3 \leq Z \leq 5$ we obtained and are discussed. *Subject Headings:* **1. Primary cosmic rays 2. Cosmic ray intensi 3. Skyhook balloon cosmic ray observations.**—*Authors' abstract.*

7D–188 551.521.

Davis, L. R.; Caulk, H. M. and Johnson, C. Y. (*all, U. S. Naval Res. Lab., Wash., D. C.*) **Primary cosmic-ray alpha particles and protons at $\lambda = 55°$N.** *Physical Review*, New York, 101(2 800–806, Jan. **1956.** 10 figs., 2 tables, 12 refs. **DLC**—Measurements were made with a balloo borne Geiger-proportional counter telescope which contained absorbers of mercury or lead. Showe of particles in the telescope were detected by out of line counters and eliminated. The particl having residual ranges between 1.5 g/cm² and 43 g/cm² are shown to be secondary electrons ar secondary protons. The penetrating particles having range greater than 43 g/cm² divide into sing and doubly charged particles. Extension of the penetrating particle intensity curves to zero dep yields values for the primary intensities of 0.19 (cm² sec sterad)$^{-1}$ for protons and 0.032 (cm² se sterad)$^{-1}$ for alpha particles are absorbed exponentially in the atmosphere and the slope of t absorption curve yields the value 35 ± 7 g/cm² for their mean free path in air. *Subject Heading* **1. Primary cosmic rays 2. Protons.**—*From authors' abstract.*

1956

7D–189 551.521.

Fan, C. Y. (*Yerkes Obs., Williams Bay, Wisc.*), **Origin of cosmic radiations.** *Physical Revie* N. Y., 101(1):314–319, Jan. 1, **1956.** fig., 11 refs., 41 eqs. **DLC**—Based upon recent developmen of hydromagnetic turbulence, the interaction of a cosmic ray particle and a moving interstellar clou is investigated. It is found that the particle can be accelerated by an inductive mechanism with

mparable efficiency to FERMI's mechanisms of collision. However, the efficiency is the highest when e particle is trapped between two interstellar clouds and is accelerated by the combined action of e two mechanisms in a "push-pull" manner. It is suggested that cosmic radiations are primarily celerated by such a "push-pull" mechanism in some favorable regions in our galaxy. *Subject eading:* **1. Cosmic ray origin.**—*Author's abstract.*

7D–190 551.521.64:08

Korff, S. A. (*New York Univ.*), **The meetings in Mexico.** *Physics Today*, New York, 9(3):10–12, larch 1956. photos. **DLC**—In this concise account of three international meetings held in Aug.–ept. 1955, problems discussed at the cosmic ray conference and the meeting of the CSAGI cosmic y subcommittee are reported. An outline is given of the points of discussion and agreement in e cosmic ray problems treated, such as primary flux, geomagnetic field effects, primary energy pectrum, time variations and astronomical relationships. The subject of the CSAGI meeting was tandardization of measuring equipment and methods and the use of narrow angle telescopes. *ubject Headings:* **1. Cosmic ray symposia 2. CSAGI meetings.**—*G.T.*

7D–191 551.521.64

Messerschmidt, Wilhelm, **Kosmische Strahlung.** [Cosmic radiation.] *Akademie der Wissenchaften zu Berlin, Wissenschaftliche Annalen*, 5(2):87–108, Feb. **1956.** 19 figs., 2 tables, 5 refs. **WB, DLC**—The history of cosmic ray research and instrumental development is reviewed. Propties of the different cosmic ray components and the various nuclear phenomena they produce are escribed, listed in a table and illustrated by cloud-chamber photographs and traces produced in hotographic plates. Primary cosmic radiation is considered to be essentially constant, its variations eing caused by atmospheric (pressure, temperature, humidity) changes and by the earth's magnetic eld. *Subject Heading:* **1. Cosmic radiation.**—*G.T.*

7D–192 551.521.64

Morrison, P. (*Cornell Univ., Ithaca, N. Y.*), **Solar origin of cosmic-ray time variations.** *Physical Review*, New York, 101(4):1397–1404, Feb. 15, **1956.** 3 tables, 19 refs., eqs. **DLC**—A common ause for all of the nonflare cosmic ray changes is here proposed: time (and energy) modulation of he incoming cosmic ray beam by the random diffusion of the particles through turbulent clouds of nagnetized plasma emitted from the sun. The origin of the clouds in active centers and the channels n magnetic monopole regions of the sun are discussed, and parameters obtained which describe he clouds, and their motions, adequate to produce the observed effects and quantitatively, astrohysically plausible. *Subject Heading:* **1. Solar effects on cosmic rays.**—*From author's abstract.*

7D–193 551.521.64

Norman, R. J. (*Univ. of Melbourne, Australia*), **Influence of the earth's magnetic field on air showers.** *Physical Review*, New York, 101(4):1405–1406, Feb. 15, **1956.** fig., 5 refs. **DLC**—COCCONI has estimated that the deflection of air shower particles in the earth's magnetic field should roduce some ellipticity of shower structure, with the major axis in the E-W direction. Experimental vidence is advanced to show that the variation in shower structure at sea level is less than 4%, which compares favorably with COCCONI's theoretical value of $\sim 2\%$ and proves that, at low altitudes, the displacement of particles from the shower axis produced by the earth's magnetic field is negligible in comparison with Coulomb scattering. *Subject Heading:* **1. Geomagnetic effects on cosmic rays.**—*Author's abstract.*

7D–194 551.521.64

Sekido, Yataro; Yoshida, Sekiko and Kamiya, Yoshiko, **Search for point source of cosmic rays.** *Nature*, London, 177(4497):35–36, Jan. 7, **1956.** fig., ref. **DWB**—Observations at Nagoya, Japan, with a cosmic ray telescope at zenith distance 80° confirm a point source at $\alpha = 5$ h 30 m. *Subject Headings:* **1. Cosmic ray origin 2. Nagoya, Japan.**—*C.E.P.B.*

SUPPLEMENTARY MATERIAL

7D–195 551.521.64:551.508.77

Gerdel, R. W. (*SIPRE, Wilmette, Ill.*), **Development of the radioactive snow gage.** *Eastern Snow Conference, 9th, Springfield, Mass., Feb.* 1952, **Proceedings,** p. 1–12. 10 figs., 4 refs. **DWB**—In measuring the water equivalent of snow by means of the radioactive snow gage developed by the author in 1950, it was necessary to allow for the background cosmic ray variations which amount to 25% during disturbed conditions. Cosmic ray energy is 30,000 times that of Co^{60}. However by running simultaneous cosmic ray counts, or by averaging snow measurements over several days and subtracting for the average diurnal cosmic ray count (Geiger counter) good results can be obtained,

Allowance must also be made for decay of the Co^{60} used in the sampler. Results of test made
field stations in the Central Sierras are described and illustrated to show how core samples a
recording gage measurements agree with Co^{60} tests. *Subject Headings:* **1. Radioactive snow gag
2. Cosmic ray effects on radioactive snow gages 3. Central Sierras.**—*M.R.*

7D–196 551.521.64:550.3

†Nagashima, Kazuo (*Earth Science, Kyoto Univ.*), **The world-wide variation of cosmic ray i
tensity by the electro-magnetic field.** *Journal of Geomagnetism and Geoelectricity*, Kyoto, 5(4):14
167, Dec. **1953.** 22 figs., 4 tables, 39 refs., 30 eqs. **DLC**—The variation of cosmic ray intensi
by the static electric field surrounding the earth was calculated in a previous paper. In it a great
advantage was indicated in explaining the cosmic ray intensity decrease at the time of the magne
storm by the electric field hypothesis than by the magnetic field hypothesis suggested by S. CHAPMA
In the present paper, the intensity variations of the ionizing and neutron components produced
the variation of the static electric field are calculated in detail extending over various altitudes a
latitudes. By comparing these calculations with observations, it can be concluded that this electr
field hypothesis is possible in explaining the phenomenon of the world-wide variations in intensi
pointed out recently by various authors. It may be possible that the diurnal variation of cosm
ray intensity can be produced by an electric field not derived from potential. *Subject Heading*
1. Cosmic ray variations 2. Cosmic ray theory 3. Magnetic storms.—*Author's abstract.*

7D–197 551.521.64:550.3

Yoshida, Sekiko and Kamiya, Yoshiko (*both, Physical Inst., Nagoya Univ.*), **Latitude effe
of the intensity decrease in the cosmic-ray storm.** *Journal of Geomagnetism and Geoelectricit*
Kyoto, 5(4):136–140, Dec. **1953.** 3 figs., 4 tables, 16 refs. **DLC**—The latitude effect of the cosm
ray decrease associated with the magnetic storm was determined from the data obtained in
periods of observation at various stations over the world. The result was in accordance wi
NAGASHIMA's electric field theory. *Subject Headings:* **1. Latitude effects on cosmic rays 2. Ge
magnetic effects on cosmic rays 3. Cosmic ray theory.**—*Authors' abstract.*

7D–198 551.521.64:551.594.

Tsai, Chŭ and Morand, Max, **Sur la perte d'énergie, par ionisation, de la composante nucléai
dans l'atmosphère.** [Energy loss of the nucleonic component in the atmosphere due to ionization
Académie des Sciences, Paris, Comptes Rendus, 239(25):1786–1788, Dec. 20, **1954.** 4 refs., 2 eq
DWB—Energy losses of the nucleonic component are calculated by means of momentum spectr
The value for the high latitude of 50° is approximately 120 MeV cm^{-2} sec^{-1} $sterad^{-1}$, which is
higher value than that estimated by ROSSI. *Subject Headings:* **1. Nucleonic component of cosm
rays 2. Cosmic ray energy balance.**—*Transl. of authors' abstract.*

7D–199 551.508.25:551.521.

Vaze, G. H. (*Bombay*), **On the efficiency of large area liquid scintillation counters for cosm
rays.** *Journal of Scientific and Industrial Research*, Sec. A, 13(8):527–530, Aug. 1954. 4 figs
4 refs. **DLC**—A single 1P21 photomultiplier was used to view the scintillations produced in
large area liquid counter by cosmic rays, and the efficiency data obtained with the instrument a
presented. The difficulties and limitations of using a single photomultiplier are discussed. *Subje
Headings:* **1. Photomultiplier 2. Cosmic ray measurement.**—*Author's abstract.*

7D–200 551.521.

Bhagavantam, S. and Murty, D. S. R. (*Hyderabad, India*), **Azimuthal variation of cosmic ra
intensity for zenith angle 60° at Hyderabad, India.** *Indian Journal of Meteorology and Geophysic*
Delhi, 6(2):159–162, April **1955.** fig., 2 tables, 21 refs. **DWB, DLC**—The literature on the az
muthal variation of cosmic ray intensity for constant zenith angles is reviewed and the experiment
procedure for studying the azimuthal variations at Hyderabad is described. "The soft componen
is eliminated by introducing a lead absorber in each of two telescopes. The energy range explore
is between 416 and 721 millistormers." It was found "that all primary cosmic rays are positivel
charged or at least the negative primaries are few in number." *Subject Headings:* **1. Primary cosm
rays 2. Cosmic ray asymmetry.**—*I.L.D.*

7D–201 551.521.

†Carmichael, Hugh and Steljes, John F. (*both, Chalk River Lab., Atomic Energy of Canada Ltd
Ontario*), **Cosmic-ray ionization bursts in an unshielded 8-inch pressurized sphere at sea leve
Physical Review, N. Y., 2nd Ser. 99(5):1542–1550, Sept. 1, **1955.** 9 figs., table, 43 foot-refs., eq
DLC—Two thin-walled (1/16-inch steel-1.22 g cm^{-2}) spherical ion chambers, 8 in. in diameter, fille
with best quality (99.8%) commercial cylinder argon at 50 atmospheres, have been used to measu
cosmic ray ionization bursts near sea level. The bursts in one ion chamber were measured by mea

of a vibrating reed electrometer and in the other by an electrometer tube and dc feedback amplifier. The results from the two ion chambers agreed to within two percent except that the smallest bursts could not be detected with the vibrating reed instrument. The integral size frequency distribution of the bursts is given for sizes from 2×10^4 to 3×10^2 ion pairs and the corresponding frequencies range from 3×10^4 to 3×10^{-4} burst per hour. The size-frequency distribution has been separated into five components identified respectively with single μ mesons, electrons, single protons, star processes, and extensive electron showers. These components have been resolved by comparison of the unshielded distribution with that obtained under a 27-cm lead shield and the interpretation of their origin has been confirmed by coincidence experiments involving Geiger counters, Cerenkov proton selector, and other ion-chambers. The existence of a sharp kink in the size-frequency distribution curve, similar to that reported by Carmichael and Chou in 1939, is confirmed. *Subject Headings:* **1. Cosmic ray ionization 2. Cosmic ray burst frequencies.**—*Authors' abstract.*

7D–202 551.521.64

†Davis, Leverett, Jr. (*Calif. Inst. of Tech.*), **Interplanetary magnetic fields and cosmic rays.** *Physical Review*, N. Y., 100(5):1440–1444, Dec. 1, **1955.** 2 figs., 14 refs., 17 eqs. **DLC**—The existence in the region around the sun of a field-free cavity in the galactic magnetic field seems indicated by the low-energy cosmic rays that reach the earth from the sun. Such a cavity would be produced by the solar corpuscular emission. A mean radius of the order of 200 times the distance from the sun to the earth may be estimated for this cavity by balancing the flux of momentum against the lateral pressure exerted by a field of 10^{-5} gauss. Such a cavity would trap cosmic rays of energy less than 100 Bev for periods long compared to a sunspot cycle, but does not seem to make possible a solar origin of cosmic rays. Expected fluctuations in cavity size would explain the 4% fluctuation in cosmic ray intensity observed by FORBUSH. A simple model of the cavity is considered in some detail, rates of escape from and entry to the cavity, acceleration by the FERMI mechanism, and change in energy density being estimated. More complicated models involving a solar magnetic field are considered briefly. *Subject Heading:* **1. Cosmic ray theory.**—*Author's abstract.*

7D–203 629.19(09):551.521.64

Fesenkov, V. G., **Problem astronavtiki.** [Problems of astronautics.] *Priroda*, Moscow, 44(6):11–18, June **1955.** 4 figs., ref. **DLC**—A brief account is given of research in astronautics in the U.S.S.R. beginning with the work of KONSTATIN EDUARDOVICH TSIOLKOVSKIĬ. A list of books on astronautics published during the 20's and 30's is presented and the present activity on popularization of astronautics is mentioned. The author discusses the Wac Corporal (illustrated with photographs) and considers the problem of measuring the pull of gravity in interplanetary travel, protection against meteorites and cosmic rays, navigation of the interplanetary vessel and the problems of return. *Subject Headings:* **1. Interplanetary flights 2. History of astronautics 3. U.S.S.R.**—*I.L.D.*

7D–204 551.521.64:551.590.21

Neher, H. Victor and Stern, Edward A. (*both, Normal Bridge Lab. of Physics, Calif. Inst. of Tech.*), **"Knee" of the cosmic-ray latitude curve.** *Physical Review*, N. Y., Ser. 2, 98(3):845–846, May 1, **1955.** 2 figs., 3 refs. **DLC**—Cosmic ray effects, as determined by an ionization versus air-mass-overhead curve obtained near the geomagnetic pole were considerably different in 1951 than 1954, especially at lowest pressures. The increased slope at lowest pressure is evidence for low-energy particles present in 1954 and absent in 1951. Flight in 1954 reached 95,000 ft. The curves for ionization versus latitude also show marked difference between 1951 and 1954 N. of 55° geomagnetic lat. Data confirms S. E. FORBUSH's (1954) suggestion that there is an inverse relation between solar activity and cosmic ray intensity, since in summer of 1954 the sun was at its lowest ebb in 22 yrs and permitted particles of low energy to get through to the earth. *Subject Headings:* **1. Latitude effects on cosmic rays 2. Solar effects on cosmic rays.**—*M.R.*

7D–205 551.521.64

Remy, E. and Sittkus, A. (*Freiburg, Germany*), **Der Tagesgang der kosmischen Ultrastrahlung, I.** [Daily variation of cosmic radiation, Pt. I.] *Zeitschrift für Naturforschung*, Tübingen, Sec. A, 10(2):172–173, Feb. **1955.** 3 figs., 7 refs. **DLC**—Observations made at the Schauinsland Observatory near Freiburg im Breisgau (Jan. 2, 1953 to Jan. 31, 1954) are analyzed to show diurnal and 27-day recurrences. Maximum at 10 h (OZ) and minimum at 22 or 23 h. A secondary maximum occurs between 16 h and 21 h. From June to Jan. the curve coincides with the geomagnetic curve. With increasing activity the diurnal curve is shifted more toward an earlier hour. From Feb. to May no geomagnetic relation shows. During magnetic disturbances the maximum shifting of phase occurs 3–6 days after the maximum Kp. *Subject Headings:* **1. Geomagnetic effects on cosmic rays 2. Freiburg, Germany.**—*M.R.*

7D–206 551.521.64

†Sarabhai, V.; Desai, U. D. and Venkatesan, D. (*all, Physical Research Lab., Ahmedabad, India*) **Solar influence on the anisotropy of primary cosmic radiation, Pt. 1, Studies at low latitudes.** *Physical Review*, N. Y., Ser. 2nd, 99(5):1490–1502, Sept. 1, **1955.** 13 figs., 5 tables, 32 foot-refs., eq. **DLC**—A study of the daily variation of meson intensity at low latitudes has been conducted with counter telescopes of identical design at Ahmedabad and at the mountain station of Kodaikanal. The analysis of the data shows that the semidiurnal component of variation, like the diurnal component, undergoes significant long-term changes. The appropriateness of a barometric coefficient applicable to the daily variation of meson intensity is discussed. Long-term changes of the daily variation reveal that these are due to the addition or attenuation of a day and a night contribution both of which are principally diurnal in character and at Ahmedabad have maxima at about 1300 and 0300 hours, respectively. For corroboration of these findings, data from 1937 to 1952, from the Carnegie Institution stations of Huancayo and Cheltenham have been analyzed. While at the equatorial station of Huancayo, the mechanism of change of daily variation is similar to what is observed at Ahmedabad and Kodaikanal, there are some differences in detail at Cheltenham, which lies in middle latitudes. There is evidence that some characteristics of the daily variation, notably the hour of maximum of the diurnal component and the amplitude of the semidiurnal component, follow the eleven-year solar cycle of activity. However, there is an indication that the nature of the composite daily variation, the hour of maximum of the semidiurnal component, and the pattern of addition and attenuation of the day and night contributions follow a 22-year cycle of change. The activity of the day and night contributions in relation to solar activity is discussed. *Subject Heading:* **1. Solar effects on cosmic rays.**—*Authors' abstract.*

7D–207 551.521.64

Rose, D. C. and Katzman, J., **The geomagnetic latitude effect on the nucleon and meson component of cosmic rays at sea level.** *Canadian Journal of Physics*, Ottawa, 34(1):1–19, Jan. **1956.** 7 figs., 18 refs. **DWB, DLC**—Measurements have been taken on the changes in intensity of the nucleon and meson components of cosmic rays during a cruise of the Canadian Naval Icebreaker "Labrador" into the Arctic, through the North West Passage, and circumnavigating the North American Continent. The geomagnetic latitudes covered extend from 18°N to 89°N. The latitude knee is clearly shown at a geomagnetic latitude of about 52° in the case of the nucleon component and less definitely between 40° and 50° in the case of the meson component. The rigidity of particles arriving in a vertical direction at 52° is 2.1 Bv and at 45° is 3.7 Bv. MEYER and SIMPSON have shown that changes in the primary spectrum between 1948 and 1954 probably extend up to these rigidities and such changes should, therefore, be observable at sea level. The longitude effect at low latitudes is clearly shown by differences in intensity between the measurements on the east and west sides of North America. In the case of the meson component, the magnitude of the longitude effect at these longitudes was found to be greater than that shown by MILLIKAN and NEHER in 1936. The interpretation of the meson component results above the knee is complicated by difficulties in temperature correction. In the case of the nucleon component, an apparent longitude effect exists above the knee in that there was a small difference in the intensity at high latitudes in the eastern and western parts of the North American Arctic. No satisfactory explanation is offered for this. The diurnal variation of the nucleon component at high latitudes is shown but no unusual features were found. Appreciation is expressed to the Royal Canadian Navy for making these measurements possible. *Subject Headings:* **1. Latitude effects on cosmic rays 2. Canadian Arctic.**—*Authors' abstract.*

7D–208 551.521.64:551.590.21

Kiepenheuer, K. O., **Solar activity.** (In: Kuiper, Gerard Peter (ed.), **The sun.** Chicago Univ. Press, **1953.** p. 322–465. 99 figs., 14 tables, refs. p. 459–465.) **DLC**—The solar component of cosmic rays is discussed on p. 451–459. Solar flare effects on cosmic rays observed during the last 15 yrs, and recent findings regarding a slowly variable solar cosmic ray component are summarized. Solar acceleration mechanisms proposed by various authors are reviewed. *Subject Headings:* **1. Solar effects on cosmic rays 2. Cosmic ray theory.**—*G.T.*

7D–209 551.521.64

Auger, Pierre; Cachon, Andre; Daudin, Alice et al., **Sur les variations diurnes en temps solaire et en temps sideral des gerbes d'Auger.** [Diurnal solar and sidereal time variations in Auger showers.] *Académie des Sciences, Paris, Comptes Rendus*, 240(25):2407–2409, June 20, **1955.** 2 tables, 3 refs. **DWB**—Further evidence is produced in support of earlier findings that (1) solar-time diurnal variations in large air showers are entirely due to atmospheric effects, whereas (2) sidereal time variations appear to be solely of galactic origin. *Subject Headings:* **1. Auger showers 2. Cosmic ray diurnal variations. I. Freon, André II. Moszkowski, Claude.**—*G.T.*

7D–210 551.521.64:061.3

International Cosmic Ray Conference. Mexico meeting. *Nature*, London, 176(4493):1105–1106, Dec. 10, **1955. DWB**—Account of conference at Guanajuato Sept. 5–13, 1955. Subjects dealt with were composition and flux of primary radiation and influence of earth's magnetic field, energy spectrum of primary radiation, time variations of cosmic ray intensity including meteorological effects, solar daily variation and direction of arrival of large air showers, and theories of origin of primary radiation. *Subject Headings:* **1. Cosmic ray research 2. Conferences.**—*C.E.P.B.*

7D–211 551.521.64:550.38

Gall, Ruth and Lifshitz, Jaime, **Albedo of cosmic rays in the earth's dipole and quadrupole magnetic field.** *Physical Review*, 2nd Ser., 101(6):1821–1824, March 15, **1956.** 8 figs., refs., 3 eqs. **DLC**—Albedo trajectories for protons of 0.5, 1.0, 1.5 and 2.0 Bev in the earth's dipole and quadrupole magnetic field were computed. The zenithal, azimuthal, latitude, and magnetic rigidity effects were studied. The quadrupole induces an asymmetry which seems only to be important near the geomagnetic equator. Shadow cones were obtained for one point of incidence. *Subject Headings:* **1. Protons 2. Albedo of cosmic rays 3. Magnetic effects on cosmic rays.**—*Authors' abstract.*

7D–212 551.521.64:551.594.12

Gunn, Ross (*U. S. W. B., Wash., D. C.*), **Raindrop electrification by the association of randomly charged cloud droplets.** *Journal of Meteorology*, Boston, 12(6):562–568, Dec. **1955.** 2 figs., 11 refs., 18 eqs. Also his: **Initial electrification processes in thunderstorms.** *Ibid.*, 13(1):21–29, Feb. **1956.** 4 figs., 21 refs., 14 eqs. **DWB**—Cosmic rays and radioactivity are indicated as primary source of free ions in the atmosphere. Diffusion of such ions onto cloud droplets and other cloud electrification processes are analyzed. (For fuller abstract, *see item* 7.3–292, March 1956, *MAB.*) *Subject Headings:* **1. Cosmic ray ionization 2. Raindrop electrification 3. Ion production theory.** —*G.T.*

7D–213 551.521.64:551.508.91

Miyake, Saburo, **A high pressure cloud chamber for cosmic ray observation.** *Physical Society of Japan, Journal*, 11(3):195-201, March **1956.** 9 figs., refs. **DWB**—A high pressure cloud chamber (50 cm in diameter, 20 cm deep and used at 150 atm.) was built in the summer of 1952. The cloud chamber can be operated automatically by counter control with a recycling time of about 20 minutes. It was filled with 5.6 kg of nitrogen or 8 kg of argon gas in its illuminated space of about 30 litres. Some cosmic ray phenomena, especially the events occurring in the gas nuclei, may be much better observed with this chamber than with the smaller one (25 cm diameter, 7 cm deep and used at 100 atm.) used previously. *Subject Headings:* **1. High pressure cloud chambers 2. Cosmic ray measurement.**—*Author's abstract.*

7D–214 551.521.64

Narayan, D. S., **Lateral structure of extensive air showers.** *Physical Review*, 2nd Ser., 101(6): 1815–1821, March 15, **1956.** 4 tables, refs., 19 eqs. **DLC**—The problem presented by air showers which have particle densities ~500 per sq meter around the shower axis and which have no multiple peaks with separations of more than a meter has been analyzed previously by HAZEN et al. using FERMI's model of meson production. The object of this paper is to show that, contrary to the conclusion of HAZEN et al., FERMI's model cannot generate such showers. On the other hand, we show that a modification by BHABHA, to the phenomenological models of meson production, which predicts greater angular concentration of the mesons produced in nucleon-nucleon collisions, can generate the showers of the type referred to above for a suitable choice of the parameter ϵ, which in this theory is the ratio of field mass to proper mass. *Subject Headings:* **1. Cosmic ray showers 2. Cosmic ray theory 3. Fermi theory 4. Meson production.**—*Author's abstract.*

7D–215 551.521.64(02)

Dauvillier, A., **Les rayons cosmiques dans leur rapports avec l'électricité atmosphérique, la météorologie, le géomagnétisme et l'astronomie.** [Cosmic rays in their relations to atmospheric electricity, meteorology, geomagnetism and astronomy.] Paris, DUNOD, **1954.** 565 p. (in 2 vols.) figs., tables, refs. **DWB**—In this comprehensive text the entire field of cosmic ray research is reviewed with over a thousand foot-references. The subject matter is divided among the eight chapters as follows: 1) Cosmic rays in relation to atmospheric ionization and electrical charge of the earth, 2) Methods of cosmic ray measurement, 3) Absorption of cosmic rays by matter, 4) Relations with geomagnetism, 5) Properties of cosmic rays, 6) Energy balance and various special effects (Čerenkov effect, biological effects, radioactivity produced by cosmic rays, effects on meteorites), 7) Cosmic-ray variations (pressure and temperature effects, positive stratospheric temperature effect, periodical variations, various meteorological effects, thunderstorm effects, magnetic storm effects, solar and cometary influences), and 8) Theories of cosmic ray origin. *Subject Headings:* **1. Cosmic ray textbooks 2. Cosmic ray bibliographies.**—*G.T.*

PART III. REVIEWS OF RECENT IMPORTANT METEOROLOGICAL MATERIAL, AND METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The references to reviews of new books or monographs and the contents of periodicals included in this section are for information only and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of publication, the pagination may be omitted.

A. REVIEWS OF IMPORTANT METEOROLOGICAL MATERIAL

Krick, Irving P. and Fleming, Roscoe: **Sun, sea and sky.** London, Gollancz, 1955. 248 p. 11 illus., 9 weather maps. Price, 16 sh. Review by [J. S. Stewart?] in *Royal Meteorological Society, Quarterly Journal*, 82(351):115, Jan. 1956.

Lönqvist, Olov: **Annual duration of sunshine in the upper atmosphere.** [In] *Annalen der Meteorologie*, 5(7/12):202-206, 1952. Review by Rudolf Czelnai L. in *Időjárás*, Budapest, 59(1) 59–60, Jan./Feb. 1955.

Monkhouse, Francis John and Wilkinson, H. R.: **Maps and diagrams.** London, Methuen, 1955. 330 p. Review by N. N. Baranskiĭ in *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 87(4):384, July/Aug. 1955.

Pawsey, J. L. and Bracewell, R. N.: **Radio astronomy: international monograph on radio.** N. Y., Oxford Univ. Press, 1955. 361 p. illus, plates. Price, $8.80. Review by Bart J. Bok in *Science*, Wash., D. C., 122(3182):1237, Dec. 23, 1955. Review by [J. A. Black?] in *Royal Meteorological Society, Quarterly Journal*, 82(351):120, Jan. 1956.

Penman, H. L.: **Humidity.** London, Institute of Physics, 1955. 71 p. Price, 5 s. Review in *Science*, Wash., D. C., 123(3186):111, Jan. 20, 1956.

Riehl, Herbert: **Tropical meteorology.** N. Y., McGraw-Hill, 1954. 392 p. Price, $8.50. Review by Charles S. Gilman in *American Geophysical Union*, Transactions, 37(1):118, Feb. 1956.

Rouch, J.: Les mers polaires [The Polar seas]. Paris, Flammarion, 1954. 251 p. Review by N. N. Baranskiĭ in *Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 87(4):385, July/Aug. 1955.

Sachet, Marie-Hélène and Fosberg, F. Raymond: **Island bibliographies.** Washington, D. C., Pacific Science Board of the National Academy of Sciences—National Research Council, 1955. 577 p. Price, $6.00. Review by Egbert H. Walker in *Scientific Monthly*, 82(1):48–49, Jan. 1956.

Saucier, Walter, J.: **Principles of meteorological analysis.** Chicago, Univ. of Chicago Press, 1955. 438 p. illus. Price, $10.00. Review by David K. Todd in *Science*, Wash., D. C., 123(3188): 187–188, Feb. 3, 1956.

Schlichting, H.: **Boundary-layer theory.** Trans. by J. Kestin. London, Pergamon, 1955. 535 p. 295 figs., 35 tables. Price, 105 sh. Review by [O. G. Sutton] in *Royal Meteorological Society, Quarterly Journal*, 82(351):114-115, Jan. 1956. Review by W. R. Sears in *Applied Mechanics Reviews*, 9(1), Jan. 1956, No. 215.

Sidgwick, J. B.: **Amateur astronomer's handbook.** London. Faber & Faber, 1955, 580 p. 193 figs., tables. Price, 63 sh. Review by W. T. R. in *Royal Meteorological Society, Quarterly Journal*, 82(351):118, Jan. 1956.

Somme, Axel: **Jordbruckets geografi i Norge** [Geography of Norwegian agriculture]. Bergen, J. W. Eides Forlag, 1954. 415 p. maps, diagrs., illus., bibliog. English summary. Price, Norwegian Kr. 60.00. (Norwegian School of Economics and Business Administration, Publications, Geographical Series, No. 3A.) Review by Clara Rom Lougee in *Economic Geography*, Worcester, Mass., 32(1):93–94, Jan. 1956.

Steinhauser, F.; Eckel, O. and Sauberer, F.: **Klima und Bioklima von Wien, Vol. 1, Ergebnisse der langjährigen Messreihen an der Zentralanstalt für Meteorologie und Geodynamik in Wien,**

Hohe Warte [Climate and bioclimate in Vienna, vol. 1, Results of long-period measurements at the Central Office of Meteorology and Geodynamics at Vienna]. Vienna, Austrian Meteorological Society, 1955. 120 p. 122 tables. Review by [H. H. Lamb] in *Royal Meteorological Society, Quarterly Journal*, 82(351):115–116, Jan. 1956.

Störmer, Carl: **The polar aurora.** Oxford Univ. Press, 1955. 403 p. 216 figs., 27 tables. Price 55 sh. Review by D. H. McIntosh in *Royal Meteorological Society, Quarterly Journal*, 82(351): 115, Jan. 1956. Review by J. M. Stagg in *Weather*, London, 11(2):58, Feb. 1956.

Thomas, Morley K.: **Climatological atlas of Canada.** A joint publication of the National Research Council and the Meteorological Div. Pub. 1953. 253 p. Price, $2.00, from the National Research Council. Review by John Borchet in *Geographical Review*, N. Y., 46(1):145–146, Jan. 1956.

Visher, Stephen Sargent: **Climatic atlas of the United States.** Cambridge, Mass., Harvard Univ. Press, 1954. 403 p. Price, $9.00. Review by John Borchet in *Geographical Review*, N. Y., 46(1):145–146, Jan. 1956. Review by Edward M. Brooks in *American Geophysical Union*, Transactions, 36(2):351, April 1955. Review by R. E. Lacy in *Weather*, London, 11(2):59, Feb. 1956.

Waldmeier, M.: **Ergebnisse und Probleme der Sonnenforschung** [Progress and problems in solar research]. 2nd ed. Leipzig, Geest & Portig, 1955. 389 p. 146 figs., 68 tables. Price, 38 DM. Review by M. A. E. in *Royal Meteorological Society, Quarterly Journal*, 82(351):118, Jan. 1956.

Woldstedt, Paul: **Das Eiszeitalter: Gundlinien einer Geologie des Quartärs, Vol. 1** (Ice age: basis of a geology of the Quaternary, vol. 1]. 2nd ed. Stuttgart, F. Enke, 1954. 374 p. 136 figs. Price, 41 DM. Review by [C. E. P. Brooks] in *Royal Meteorological Society, Quarterly Journal*, 82(351):117–118, Jan. 1956.

Zhegnevskaia, G. S.: **K voprosu o klimaticheskikh faktorakh uvlazhneniia iuga evropeĭskoi chasti SSSR** [Climatic factors in the humidification of the southern European part of the U.S.S.R.]. [in] *Vessoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(6), 1954. Review by G. T. Selianinov in *ibid.*, 87(4):360–362, July/Aug. 1955.

Zierep, J.: **Forces and moments on a drop in a horizontal air current with vertical shear.** *Zeitschrift für Flugwissenschaft*, 3:22–25, Jan. 1955. In German. Review by W. Hitschfeld in *Applied Mechanics Reviews*, 8(12):547, Dec. 1955.

Zubenok, L. I.: **Ob opredelenii ispariaemosti dlia zasuchlivykh raionov SSSR** [Determination of evaporation for arid regions of the U.S.S.R.]. [In] *Vessoiuznoe Geograficheskoe Obshchestvo, Izvestiia*, 86(6):1954. Review by G. T. Selianinov in *ibid.*, 87(4):360–362, July/Aug. 1955.

B. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Geofisica e Meteorologia, Genoa, Vol. 3, No. 6, 1955

Bossolasco, Mario: **Alcuni caratteri del moto ondoso e la mareggiata eccezionale nel Golfo di Genova del 19 Febbraio 1955,** [Some characteristics of wave motion and the unusual tide in the Gulf of Genoa, Feb. 19, 1955], p. 131–138

Aliverti, Giuseppina: **Sopra due fenomeni di elettricita temporalesca,** [On two phenomena of thunderstorm electricity], p. 138–139

Depietri, Carlo: **Analisi periodale della serie pluviometrica di Modena, 1830-1954,** [Periodical analysis of rainfall series, Modena, 1830–1954], p. 140–144

Moja, Mario: **La nebbia a Milano: risultati di 120 anni di osservazioni,** [Fog at Milan: results of 120 years of observations], p. 145–152

Geophysica, Helsinki, Vol. 5, General Geophysics, No. 2, 1956

Korhonen, V. V.: **Risto Sakari Jurva: In memoriam,** p. 53–57

Keranen, J.: **Gustaf Eyvind Sucksdorff, 1899-1955 [Obituary],** p. 58–62

Thiesen, K.: **On the determination of D by means of QHM,** p. 63–69

Porkka, M. T.: **Results of measurements with Renqvist's evaporation recorder in South Finland in summer 1950,** p. 70–77

Niinivaara, K.: **Evaporation from small catchment areas in Finland,** p. 78–94

Sucksdorff, E.: **Influence of the moon and the inner planets on the geomagnetic activity,** p. 95–106

Simojoki, Heikki: **Long rhythmic water level variations in Lake Saimaa compared with the fluctuations in some climatological elements,** p. 107–112

Időjárás, Budapest, Vol. 59, No. 5, Sept./Oct. 1955

Kulin, István: Az agrárklimatológia néhány kérdése, [A few problems in agricultural climatology], p. 257–267

Predmerszky, Tibor: Munkahelyek komfortjának jellemzése, [Comfort considerations of workrooms], p. 268–274

Péczely, György: A föld hőmérsékletének változása, [Change of temperature of the Earth], p. 275–281

Bodolai, Emma (Jakus): A hőmérséklet számszerű előrejelzése Budapestre, [Numerical forecasting of temperature for Budapest], p. 282–291

Dobosi, Zoltán: A talajfelszín hőhaztartása és annak mérése, [Thermal balance of the soil surface and its measurement], p. 292–298

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Kakas, József: Az Orsz. Meteorológiai Intézet igazgatójának látogatása a Szovjetunióban, [Visit of the Director of the Hungarian Met. Institute to the U.S.S.R.], p. 305–306

Hille, Alfréd: Felhőtölcsér a ferihegyi repülőtéren 1955. július 14-én, [Funnel cloud at the Ferihegy airport on July 14, 1955], p. 306–308

Kulin, István: Az Akadémia meteorológiai főbizottságának ülései, [Meetings of the meteorological committee of the Hungarian Academy of Science], p. 308

Nagy, Lajos and Szabó, Bálint: Fagyváltakozások Debrecenben, [Frost alternation in Debrecen,] p. 309–311

Béll, Béla: Napsugárzásmérések Tihanyban, [Solar radiation measurements in Tihany], p. 311

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Aujeszky, László: A "mesterséges hold" létesítésének meteorológiai kérdései, [Meteorological aspects of "artificial satellites"], p. 312–313

Kakas, József: Az első magyar földrajzi kongresszus, [The first Hungarian geographical conference], p. 314

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R.: Amikor Benvenuto Cellini "elűzte" az esőfelhőket, [When Benvenuto Cellini "chased away" the rainclouds], p. 315

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Ozorai, Zoltán: Rendkívül heves szélvihar a Balatonon, [Unusually heavy storm over Lake Balaton], p. 316–318

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Aujeszky, László: Az elemző szinoptikától a számoló szinoptikáig, [From synoptic analysis to synoptic computing], p. 319–320

Journal of Agricultural Meteorology, Tokyo, Vol. 11, No. 1, July 1955

Okamoto, K.; Izumi, S.; Kodaka, S. and Oka, Y.; **On the relation between the air temperature and ripening condition of Senbon-asahi (paddy rice) at Konosu, Saitama prefecture**, p. 1–2

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Journal of Meteorological Research, Tokyo, Vol. 7, No. 9, Oct. 1955

Aota, T.: **On the development of the cyclone of May 9-10, 1954**, p. 523–528
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Yamashita, Y. and Kasugai, T.: **Forecast of the heavy snowfall by monsoon in Fukushima Prefecture (Researches on the weather forecast in Fukushima prefecture under monsoon in winter, Pt. 2)**, p. 540–552
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